FOOD INDUSTRIES

manufacturing and processing

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Plan Constructively for the Future

IT IS timely to urge food manufacturers to take advantage of this period of decreased costs to revamp, rebuild, and modernize in preparation for the better days that are coming. However, some of the good intentions that grow out of such urging may not bear fruit without a knowledge of the goal which is possible of attainment. Accordingly, FOOD INDUSTRIES celebrates its second birthday by offering a model plant number, showing what others have achieved.

THE TWO PLANTS chosen for detailed study happen to lie in the dairy field, but they could have been taken from any other branch of the industry. It was no easy task to choose plants for description, for chance had no place in their selection. Knowing that the dairy group possesses a more highly developed appreciation and technique of sanitation than any other division of food processing, and being aware of its highly developed materials handling methods, it seemed particularly desirable to concentrate our attention there.

ODDLY ENOUGH, neither of the plants with which this number deals is entirely new; yet each has features worthy of the closest study. One embodies long-range planning; the other is designed to permit diversified manufacture.

THE INDUSTRIAL EVOLUTION of the Wieland plant was brought about by men of creative imagination and courage, with sufficient capital to develop their soundly conceived plans. In tracing its history, one finds that the company has been a pioneer in many of the changes that have come to the industry. In discussing its features, the purely dairy aspect has been subordinated to the fundamentals that are common to all food industries: temperature control, building designs, floors, sanitation, power generation, materials handling, and planning for the future.

THE KRAFT-PHENIX PLANT was selected because of its unusual equipment, permitting the greatest diversification of output from the same raw materials. On remarkably short notice, measurable at times in minutes and at most in hours, it is able to change its whole line of manufactured products. The economic necessity back of this arrangement is set forth. It is very suggestive of the need for similar studies in other industries, for possession of the proper equipment in itself is not sufficient. The directing mind must be always a factor of equal importance.

THE DISCUSSION is rounded out by E. G. Montgomery on trends in consumption of dairy products and by an interview with Harry A. Cronk, who shows what a thin—almost microscopic—profit exists in the distribution of milk. If other industries were constantly faced by similar necessity they, too, might be forced to be more efficient.

THESE PEOPLE are cognizant of that fundamental philosophy of life: that to receive much one must give much. All have freely shared their knowledge with others. The generosity of these gestures is acknowledged by FOOD INDUSTRIES. Their contributions to this number cannot fail to enhance their company morale and will be of great assistance to all who are charged with the duty of improving the efficiency of food manufacturing plants.

A feature of this modern dairy that some other industries might well copy is the central reception room. This has glass walls, permitting the visitor to see the whole range of pasteurizing, bottle-washing, filling operations, and the laboratory, without leaving the room

Why We Built

A MODEL PLANT

By CHARLES J. WIELAND
President, Wieland Dairy Company
Chicago

BACK of every successful business is a story of struggle; the story of a man's life devoted to carrying out a definitely preconceived plan based upon past experience and a vision of the future, and hewing straight to the line.

In 1888, the Wieland Dairy Company (since June, 1928, a member of that rapidly increasing group gathered under the control of the Borden Company) was started, having for its only capital a father and seven sons. By giving a note and a promise to pay, the father was able to purchase the one wagon with which the business was started, and as the venture grew each of the boys was successively brought into it.

Every dollar that could be spared was put into the business. This policy has been carried out throughout its entire history and, in my opinion, is one of the most important factors contributing to its success. Such a policy has made it possible to have the funds available with which to grow and to meet the many radical—almost fundamental—changes which have come to the dairy business since this firm was started.

The first fifteen years was a continual struggle to acquire necessary capital to meet the growth and changes that the business was undergoing. When the business was first started, loose milk was still distributed from the old pouring can. Later the pasteurizing laws came into effect, revolutionizing the whole industry. These required the selling of milk in glass bottles, the building of pasteurizing and bottling plants, and necessitated the expenditure of considerable sums of money, which, at that time, appeared to most of the men in the milk business as an insurmountable obstacle.

Up to the year 1920 or 1921, owing to the cheap labor available in the country, and also to the fact that receiving stations were already located there, it was deemed advisable from an economic viewpoint to bottle all milk in the country. This fact was also regarded as a feature worthy of advertising and "Milk Bottled in the Country" was the slogan of those days. But as time went on, and the volume of business grew, we saw the disadvantages of bottling milk in the country and laid our plans to build an up-to-date plant in the city of Chicago—a plant that also would be a showplace, open to the public at all times, for the value of public confidence and good will was beginning to be recognized.

All of our country bottling plants at that time were located along the Chicago, Milwaukee & St. Paul Railroad and, in making our plans for future development that would include bottling in the city, it was only logical that a tract of land on the main line of the railroad should be purchased for the construction of the new plant. This would eliminate many of the troubles due to delays of shipments caused by storms and railroad wrecks, which, in turn, were responsible for delays in service to the consumer. And by those who have had no experience in the distribution of milk it should be definitely understood that the consumer is quite unforgiving of delays, regardless of how justifiable they may be or

how helpless and impotent the dairyman may be when all the country is in the grip of a blizzard. This insistence of the consumer upon uninterrupted service is understandable particularly where there are little children in the homes who depend on the daily service of the milkman for existence itself.

A customer disappointed was almost invariably a customer lost. It was imperative that our future operations should be conducted on a plan whereby an ample reserve of this most perishable food would be available in the city to meet such contingencies. Yet it must be done in an economical manner, for the distribution of milk, although a business dealing in the necessities of life, is nevertheless a business and should be operated at a profit.

One of the objections to bottling milk in the city ten years ago was the problem of handling the raw material, which at that time was transported in 10-gal. cans. This required the presence of large holding tanks in the city plant and large space available for the storage of the empty cans and for the can-washing operation. To circumvent this problem we conceived the idea of shipping milk in glass-lined tanks, placed in insulated railroad cars, thereby eliminating the problems of the 10-gal. milk cans. At that time we were operating a bottling plant 46 miles from the city. The transportation charge to the city was $0.14 per case of 12 qt., which also included the return of the empties to the country bottling plant.

Plant of the Wieland Dairy Company in Chicago. Although this is a "rebuilt" plant, that fact is not evident

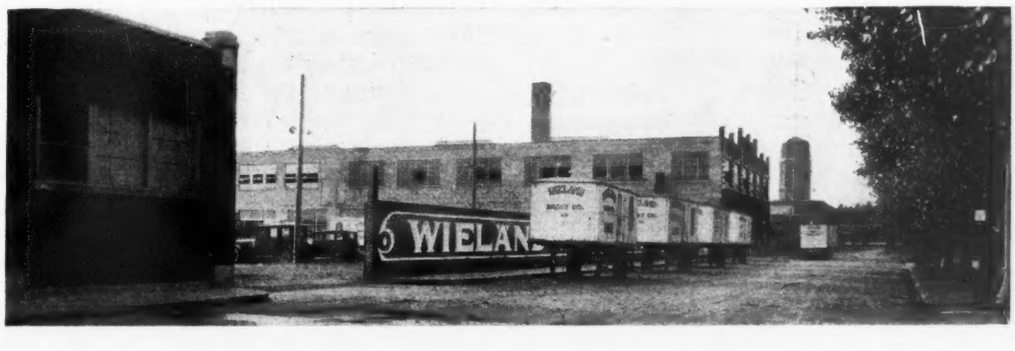
As an experiment, three cars, each equipped with two glass-lined tanks with a total capacity of 50,000 lb. per car, were ordered by us from the General American Tank Car Company. The railroad company established a rate of $0.24 per 100 lb., and allowed us a mileage of one-half cent per mile for the operation of each car. This made a saving in freight of $0.29½ per 100 lb. of milk, and also reduced the labor cost necessary to fill the cans, place them in the cars, unload at the city plant, wash and replace them in cars for shipping back to the country.

Transporting milk by this method proved to be successful beyond all expectation and ultimately has revolutionized the entire system of handling milk throughout the industry. Furthermore, it has established an economic basis for bottling a large volume of milk at a given point. It improved the sanitary conditions connected with the handling of the product, not only at the receiving station, the city bottling plant, but while in transit. It also improved the quality of the bottled milk by either eliminating or greatly reducing the danger of contamination during the transportation.

All of these problems were carefully thought out and planned before we built our first bottling plant in the city. We also gave careful consideration to planning for future expansion, in order to take care of the predictable growth of the business. This was done by making three sets of plans, one for the plant now to be erected and another for the plant of the future when it would be double its original capacity. We still have a third plan for further future expansion. The plant is now in its second stage of growth or expansion. Although it has all the appearance of a new plant, it is in reality a plant that is ten years old; and if today it has the harmonious appearance and efficiency of a recently constructed unit we feel that it is because of the care and forethought that have been expended upon its design. The expansion into the second phase began in 1928 and is now almost entirely complete. The change was of necessity a slow one, for we had to keep on operating seven days a week during all the changes. All alterations were arranged far in advance so that they could be carried out without interfering with the efficient and economic operation of the plant and at a minimum of expense.

The first of these contemplated alterations has been completed and plans have been visualized for the second expansion, should the business demand it. All of the alterations, both of the immediate past and the future, have been planned with this end in view, and, while our organization has experienced a certain amount of trouble, that may be best described as "growing pains," during the alterations, the cost has been much less than would have been the case had it been necessary to move out and into an entirely new plant.

The vacant lot behind the fence bearing the Wieland name is now used for parking automobiles, but eventually it will be occupied by an addition to the plant that will at least double capacity



PLANNING

For Today and Tomorrow

By GEORGE C. WIELAND
Wieland Dairy Company
Chicago

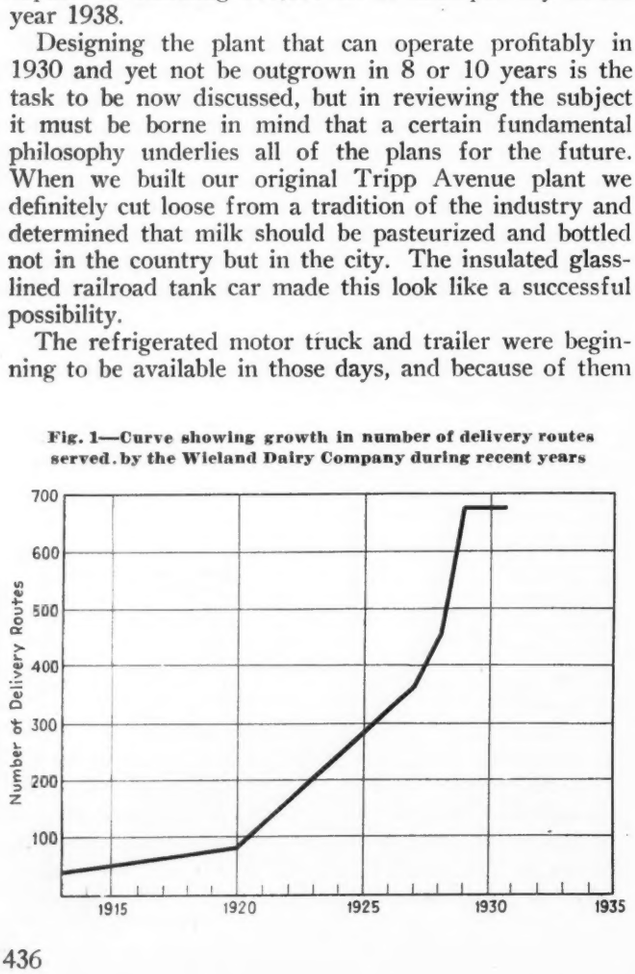
ADMITTEDLY the design of a plant capable of giving satisfaction today is made more difficult by the necessity of giving proper consideration for the future of operations when the concern shall have outgrown its present quarters. To build a new plant of the size that one hopes his business will need 10 to 15 years hence would be to increase capital expenditures to a point where it would be quite impossible to earn even a slight profit, let alone a reasonable one; therefore all that one may hope to do is to build in such a way that extensions may be made in future years with a minimum of cost and inconvenience.

All of the planning must be based on the experience of the past. Accurate statistical information about the various phases of the business plotted in curves is very helpful in arriving at the probable anticipated requirements of the reasonably near future. For example, the number of routes, which indicates the volume of milk handled by the Wieland Dairy Company for the past eighteen years, is shown in Fig. 1, and if history repeats itself (a most important conjecture) the plant should be capable of handling 500,000 lb. of milk per day in the year 1938.

Designing the plant that can operate profitably in 1930 and yet not be outgrown in 8 or 10 years is the task to be now discussed, but in reviewing the subject it must be borne in mind that a certain fundamental philosophy underlies all of the plans for the future. When we built our original Tripp Avenue plant we definitely cut loose from a tradition of the industry and determined that milk should be pasteurized and bottled not in the country but in the city. The insulated glass-lined railroad tank car made this look like a successful possibility.

The refrigerated motor truck and trailer were beginning to be available in those days, and because of them we conceived the idea of a single central pasteurizing and bottling plant to serve a number of distributing branches located strategically in the city of Chicago. And since all the processing equipment was to be located in a single plant it became doubly imperative that we design the new establishment in such a way that it would be capable of successive expansions, or otherwise an *impasse* might be met.

Fig. 1—Curve showing growth in number of delivery routes served by the Wieland Dairy Company during recent years



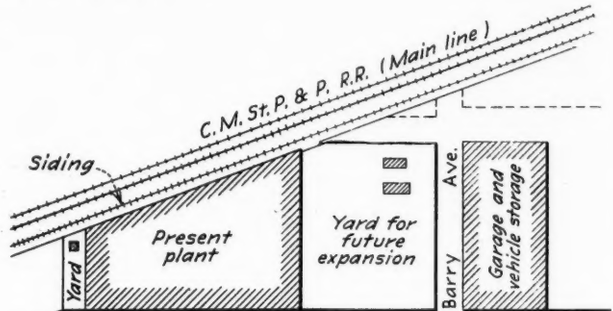


Fig. 2—Plot plan of the Wieland Dairy Company's Chicago plant showing the location of the buildings and yards

Along the C. M. & St. P. line was a piece of land that was suitable for all our needs. It was, roughly, two blocks long and having a width of about 100 ft. at the south, 200 ft. at the north, with the southwest corner cut off by the railroad. Since power plants are fairly well standardized for smaller establishments, we felt that no startlingly revolutionary changes could take place there and that it would be safe to place the power unit at the narrow end of the property, feeling that it would allow sufficient space for our power needs for many years to come. By making such a decision we committed outselves to a design of longitudinal expansion, always at the farther end. This, however, was not as limiting a factor as it might seem, for as the plant grew away from the narrowest point it moved toward the wider portion of the lot, and today the manufacturing department has reached only the beginning of the point of maximum width.

At the north end of the converging part of the lot we built a stable, for the horse-drawn milk wagon was considered as an indispensable unit even in 1920. But since that time the dairy industry has been offered many varieties of motorized vehicles, and we have

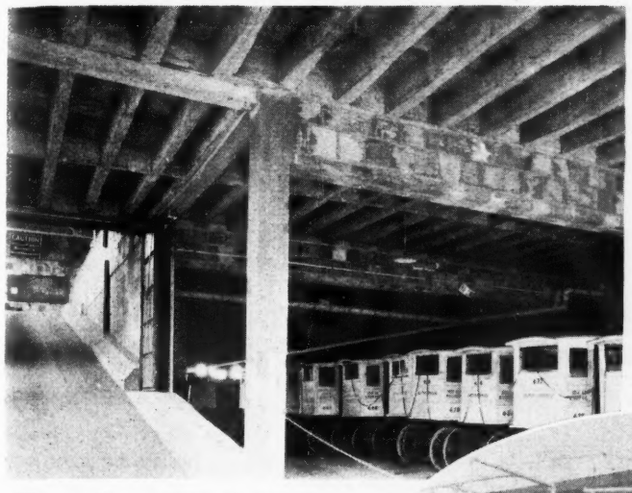


Fig. 3—Lower floor of garage building showing delivery wagons in storage

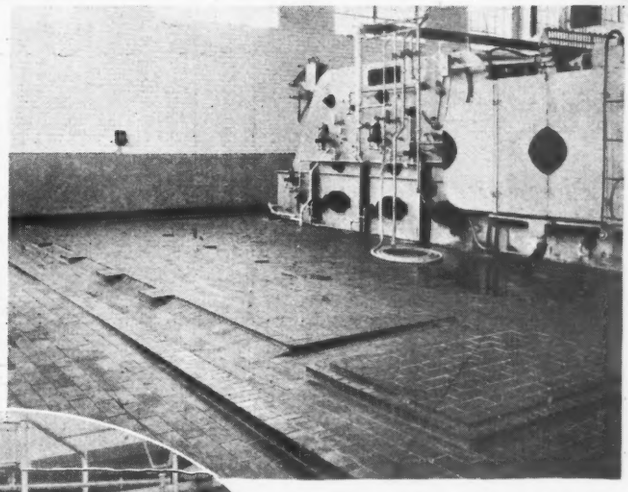


Fig. 5—Foundation ready for installation of an additional bottle washer when required

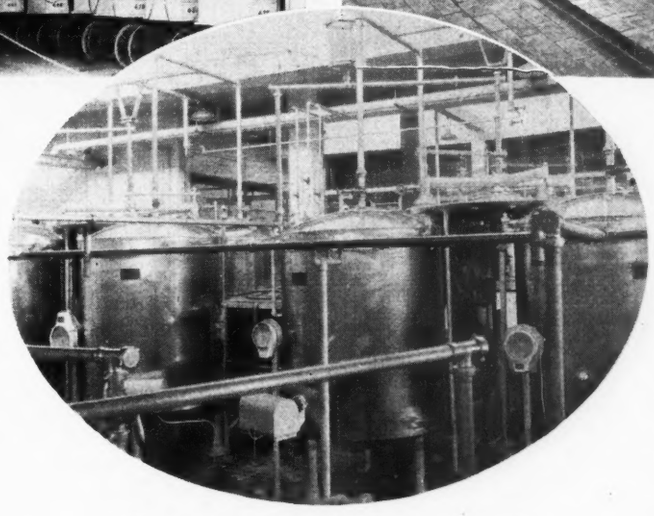


Fig. 4—A multiple unit of pasteurizers of the holder type

accepted them for experimental purposes and where practicability demanded them. This required a garage, which meant an additional building to be located in accordance with the plan for the future.

The housing of delivery equipment has been solved by a combination garage, horse barn, and wagon storage building, shown in Fig. 3, capable of accommodating 100 horses and approximately 275 vehicles. This so-called garage may be converted into a 100 per cent garage or into a combination stable and wagon storage, as the future may determine. An empty lot 200 ft. in length separates branch operations from the plant, and is the provision for future expansion and operation.

Turning now to the closer aspects of the plant, it is necessary to consider the layout of the building itself, and here it became necessary to look at the proposition from its broadest aspect. One can easily lay out a plant for tomorrow with the equipment of today, but the question will immediately arise: Will this be the same equipment that we would purchase ten years hence?

For example, less than two years ago, when the Wieland plant underwent its first real metamorphosis, we were reasonably certain that the next extension of the ice field, or ice-making department, should be into what is now our stock room, but very recently solid carbon dioxide as a refrigerant on vehicles has come into existence. It is far too early for us to say what bearing it will have on our plans, but it is not entirely beyond the realms of possibility that it will be a success in the dairy business and thus obviate a great deal of the use of water ice. In view of this single development it is evident that detailed future plans are very likely to be thrown awry. Rather, in planning ahead, it is better to have a large-scale vision but not to be too specific about what will be done ten years hence. Even a better plan is to arrange the construction of today so that tomorrow will not be hampered by small-scale ideas of today; that the larger vision that comes as we grow will not be stifled.

Therefore as we have gone on we have had a fairly clear picture of what the plant of the future would be like, but always stated in terms of today. In building in 1920 and rebuilding in 1928-30 the idea of straight-line production was uppermost and departments have been arranged so that, as we expanded longitudinally, this fundamental of all manufacturing would not be violated. Certain other fundamentals were closely watched—such as having all foundations of ample carrying capacity for any future construction. Also a great many floors were planned to carry 350 lb. per square foot, for we were not quite sure where we would place each item of future equipment.

But in the plan for the immediate future we were quite definite about where everything was to go. Practically everything down to each pipe, wire, and conduit was laid out before construction began.

One more phase of planning remains to be considered. The philosophical mind will inquire whether the future growth shall be by the installation of larger equipment or by the installation of multiple equipment. (See Fig. 4.) Our choice has been along the latter line. Therefore we have left spaces where additional units may be installed, as shown in Fig. 5, for we have felt that the multiple-unit growth is more consistent with our philosophy of having large plans but not too many specific details for the remote future.

The present pasteurizing and parallel equipment gives a capacity of approximately 40,000 lb. per hour, which will enable us to equip 1,000 wagons for city delivery if we operate on double shift. The plant can be enlarged to a still greater capacity at a comparatively small cost by additional pasteurizing, washing, filling, refrigeration, and conveyor line extensions—how far we are not obliged to say at this time but it is entirely within the realm of physical possibility.

Using BYPRODUCT POWER

Saves $7,000 Yearly

By JOSEPH ALLWEILER

Chief Engineer, Wieland Dairy Company, Chicago

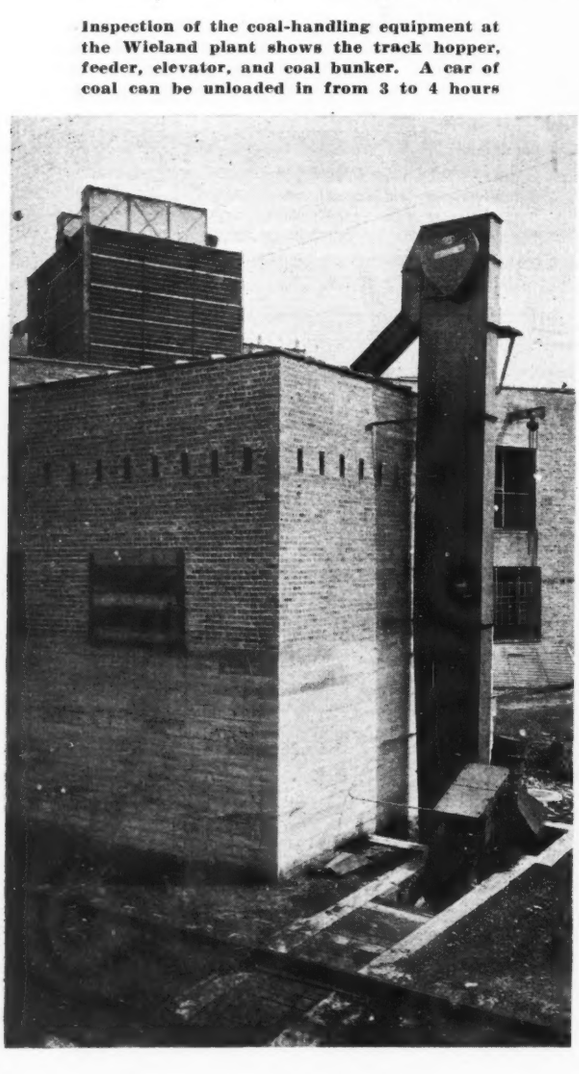
UTILIZING practically all of the potential heat and power in the coal offers a way to economy of operations in the business of pasteurizing and bottling milk. The simplest way by which to effect this economy lies in the use of what has been variously called byproduct power or byproduct steam. Proving that such economies are real is quite easy.

In the old power plant of the Wieland Dairy Company, which was rebuilt in 1928, electric power was purchased to the extent of $1,200 per month as the average charge, and $1,500 per month as the maximum in the hottest periods. Steam for processing at that time was generated in two Scotch marine boilers, operating continuously and using an average of 5 tons of coal daily. When the power plant was rebuilt in 1928 the Scotch marine boilers were replaced with two Stirling-type water-tube boilers rated at 275 boiler horsepower each. Suitable equipment was also installed to generate electric power and to utilize the exhaust steam for processing.

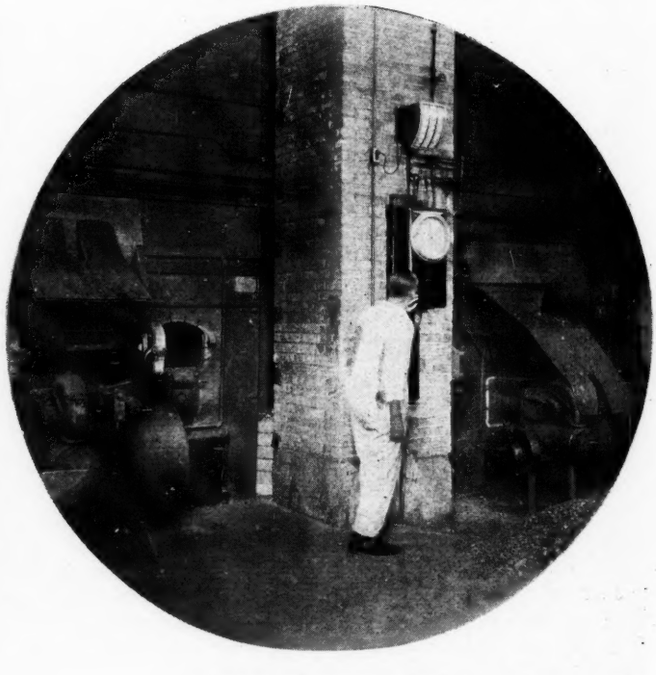
No electric power has been purchased since the new power plant was installed, and the fuel consumed averages only 9 tons per day. To visualize the economy of the new installation it should be borne in mind that in the year before the new power plant was built the average amount of cream, chocolate milk, or milk pasteurized, bottled, or otherwise processed, was 17,400 gal. per day, whereas at the present time the average amount of milk put through the plant is 52,000 gal. per day.

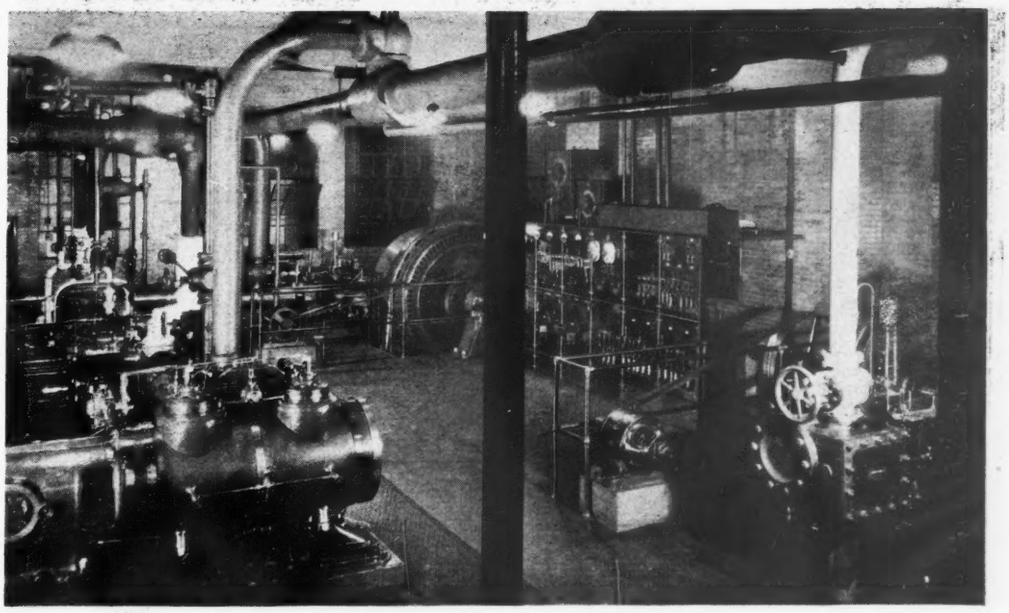
After analyzing the power and steam problem at this plant it was decided to install a boiler plant consisting of two boilers, either of which would be capable of carrying the full load, thus keeping one boiler always in reserve. Because very little high-pressure steam is used for processing in this plant, except in the washers for the 10-gal. milk cans and the bottle washers, the plan was to utilize prime movers that were capable of economical operation against a low exhaust pressure and

Inspection of the coal-handling equipment at the Wieland plant shows the track hopper, feeder, elevator, and coal bunker. A car of coal can be unloaded in from 3 to 4 hours



The stoker equipment, instruments, and recording CO_2 meter can be seen in this picture of the interior of the boiler room

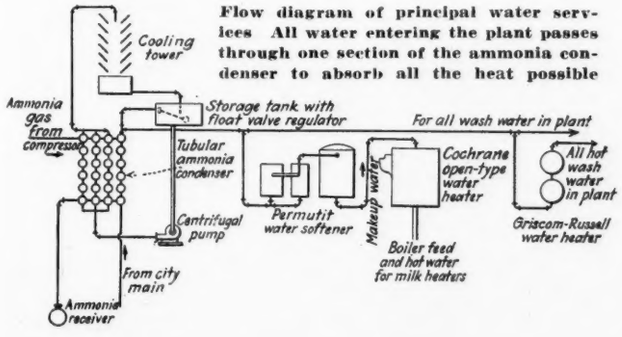




This general view of the Wieland engine room shows the engine-generator sets on either side of the switchboard, with the refrigerating units opposite

use the exhaust steam to heat water for subsequent use as the heating medium for pasteurizing. Two years' experience with the power plant, laid out in accordance with this plan, has shown that it is entirely sound in theory and very satisfactory in performance.

Water-tube boilers of the four-drum type were selected, with Detroit underfeed stokers, controlled by a Ruggles-Klingeman automatic regulator to do the firing. A recent development has been to put the damper under



Flow diagram of principal water services. All water entering the plant passes through one section of the ammonia condenser to absorb all the heat possible

the control of this regulator. Working pressure is 155 lb. gage. On the day load the boilers are driven at 150 per cent of rating, but on the summer night load the demand is only 100 per cent of rating. The night load is very steady, for it is almost entirely refrigeration except for the few lights that are required.

A further refinement of practice was the installation of a Hayes automatic CO_2 recorder which has given information of great value in controlling combustion, for when the flue gases contain 14 per cent of CO_2 the firing is most efficient. In order to check the boiler-room operations a Cochrane recording flow meter constantly records the steam demand. One of the interesting disclosures made by the flow meter is the fact that the steam consumption of a can washer is 70 boiler horsepower.

Boiler feed is by means of a motor-driven triplex pump, with a steam pump as an emergency unit and also to take care of fluctuations in the steam demand, for the triplex pump is operated by a constant speed motor. An injector is available for boiler feeding in case both pumps should fail to function. The effort in all the planning is to use the potential heat in the coal with the greatest economy, as is accomplished with the use of the motor-driven feed pump.

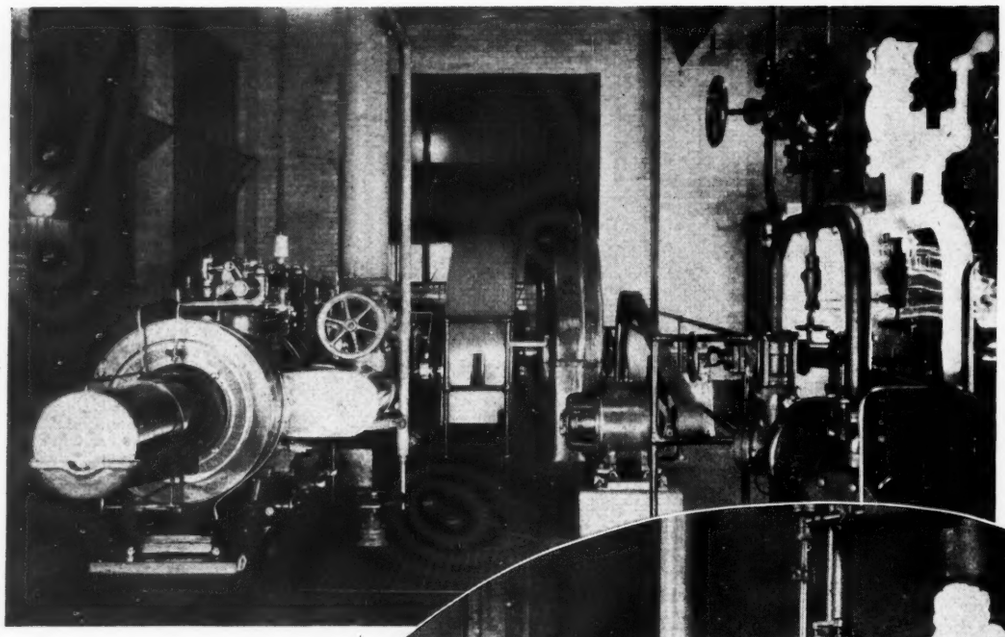
Another very economical feature of the plant is the coal bin shown in one of the illustrations. Formerly the cost of unloading coal was from 34 to 40c. per ton. The conveyor system of elevating coal to the top of the bin permits the use of hopper-bottom cars which can be unloaded in 4 hours at a cost of $2 per 55-ton car for labor and $0.60 for the electric power consumed. This gives an average unloading cost of $0.0467 per ton of coal against the former cost of $0.35 with hand labor.

In the engine room are located all the prime movers and the refrigerating machinery. A 350-hp. Skinner Universal Unaflow engine, direct-connected to a 250-kva. Crocker-Wheeler generator, furnishes the power to run all the plant machinery. Whenever necessary it can also furnish the power to drive all the refrigerating equipment. An emergency engine also is provided in the 200-hp. Skinner slide-valve engine direct-connected to an Allis-Chalmers generator which has a capacity of 90 kva. This equipment also can carry the plant load, if necessary.

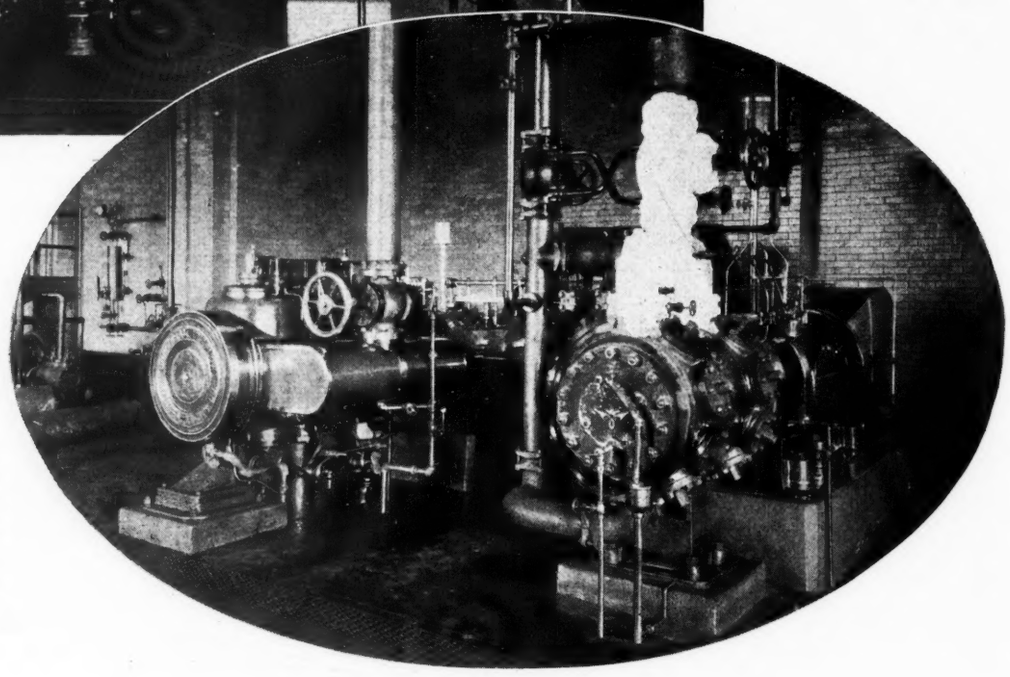
One of the two refrigerating units is a direct-connected, Skinner Unaflow-Vilter compressor of 100 tons refrigerating capacity. Standby refrigerating equipment is a 50-ton Vilter compressor driven by a 100-hp. Ideal synchronous motor. This permits driving the compressor by power either from the plant or furnished by the public utility company in case of breakdown, for in the dairy business it is absolutely necessary to have reliable refrigeration or the product will quickly spoil. The refrigerating load is one-third of the total load.

Motor-driven air compressors using our own power supply air for operating the automatic temperature-control instruments and for blowing the milk out of tank cars. Air is used also for certain operations in hood-capping the milk bottles.

At present the power plant is generating a total of



A 350-hp. uniflow engine direct-connected to a 250-kva. generator capable of carrying the entire electric load at all times is the main generating unit



The main refrigerating unit consists of a 100-ton ammonia compressor operated by a uniflow engine. It will carry the entire refrigeration load of the plant, except in the hottest weather

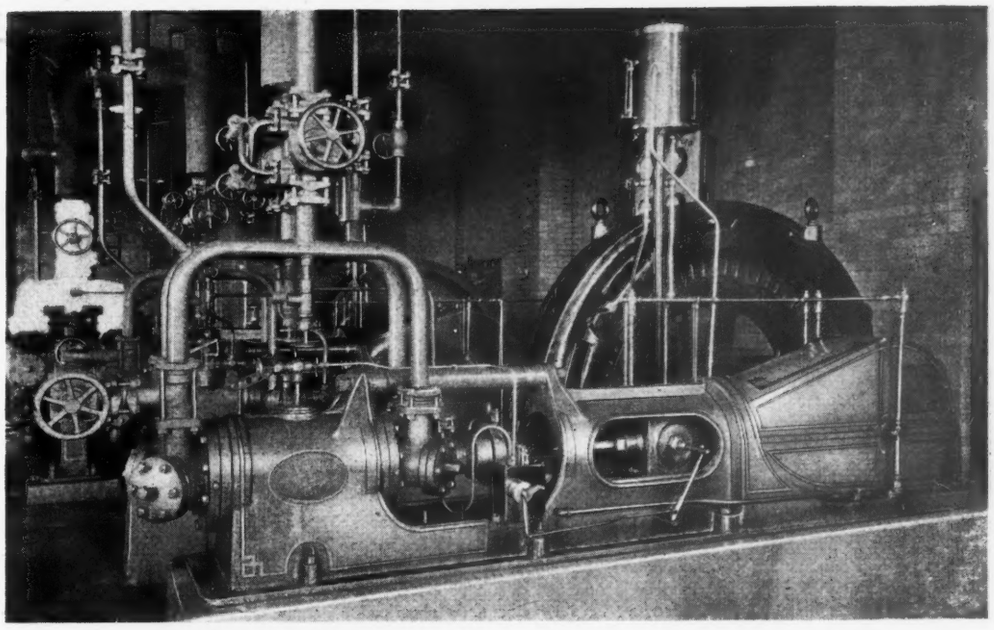
80,000 kw.hr. per month of electrical energy. If the electrically driven ice machine were used instead of the steam-driven unit, the total electrical output would be between 140,000 and 150,000 kw.hr. per month. Presenting the other side of the picture, if power were purchased from outside sources the cost would be only about $0.012 per kilowatt-hour, plus a demand charge of $2 per kilowatt per month, the latter of which would amount to about $500 per month. In Chicago the off-peak demand charge is $1.50 per kilowatt but the hours in which this figure would be applicable are such that a dairy cannot utilize them advantageously.

All of the exhaust steam from the prime movers is piped to feed-water heaters and thence to those places in the plant where steam is necessary, such as steam-jacketed holding tanks. On account of its low pressure—2 lb. gage—the exhaust steam lines are of necessity quite large, 6-in. pipe being utilized. Since it is absolutely necessary to have an adequate supply of hot water at all times when the pasteurizers are in operation the exhaust steam line is connected with a live steam line through a Fisher governor that is set to open at 0.5 lb. and to close at 2 lb. pressure.

Hot and cold water arrangements have been made with the purpose of utilizing all heat to the greatest advantage. For example, all of the city water that enters the plant for any purpose is drawn through one section of the ammonia condensers, where it takes up all the heat that it can absorb and thus contributes to the economy of that operation. By referring to the accompanying drawing the arrangement is easily apparent. Two hot-water systems are available: One is water softened by a zeolite softener and is water that is not lost from the system. The other is hot water that is used for washing operations throughout the plant and ultimately finds its way to the sewer drains.

Soft water is heated in a Cochrane open-type deaerating heater of 1,000-hp. rating and is used for operating the pasteurizing system and for boiler feed. Hard water is heated in a pair of Griscom-Russell closed-type water heaters. Motor-driven booster pumps are appropriately located to supply hot water at all places where needed and at the right pressure.

Since this dairy, like all dairies, requires ice for keeping the bottled milk cold while it is in trucks or wagons, a 50-ton manufactured ice installation is provided on the

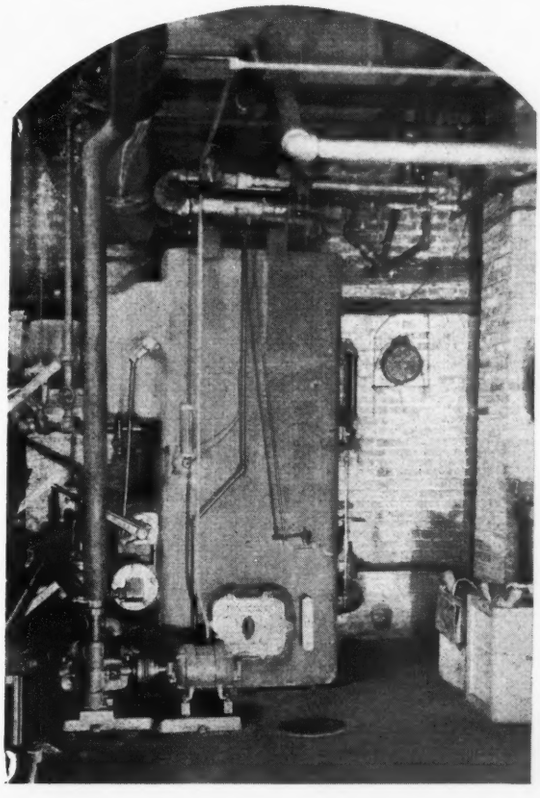


The spare refrigerating unit consists of a 50-ton compressor driven by a 100-hp. synchronous motor, and is large enough to protect the plant from milk spoilage in case the main unit must be shut down

second floor. The brine tank serves the dual functions of freezing the ice and cooling a brine cooler from which brine is drawn to all parts of the building where refrigeration is necessary, such as the storage rooms, milk coolers, and sprays in the bottle washers. In this way the whole refrigerating system is kept as simple as possible and operates very economically.

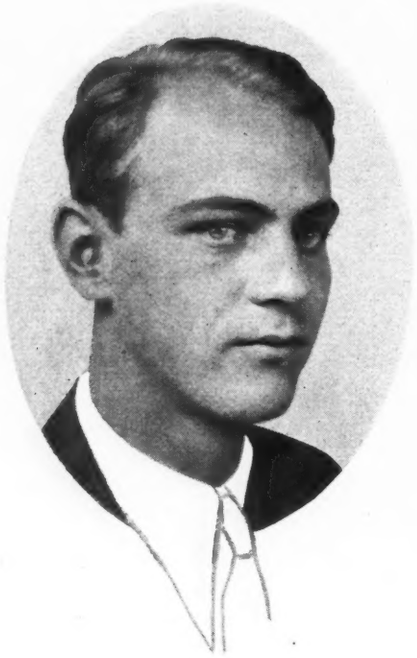
With all of the care and attention to details the full value of the fuel and water are utilized to the utmost, and by rough comparison with the operations of earlier days a saving of at least $1,200 per month is made possible through the expenditure of about 4 tons of coal per day. Figuring coal at $5 per ton, delivered, the monthly saving is, roughly, $600. While this saving is gross, the net saving is not much less, for the only depreciation chargeable against the saving is that of the new engine-generator unit and the engine-driven ice machine. All other equipment was installed before the change to self-generated power. No additional labor has been needed, so that changes in operating costs have not been great. However, this economy would not be possible unless the business of the company offered a huge outlet for by-product steam.

Water for the boiler supply and for the milk heaters passes through this open-type feed water heater after it has been treated in a zeolite water softener



One of the plans for the future involves discarding all horse-drawn milk wagons and replacing them by electrically operated vehicles. Their storage batteries will be charged at night by electricity generated in our own plant, which now has an unused power generating capacity of 100 kw. during those hours. This means that a battery charging load up to 100 kw. can be carried at night without any additional equipment except the charging equipment itself being needed.

PROFITS *Are Made or Lost Through* MATERIALS HANDLING



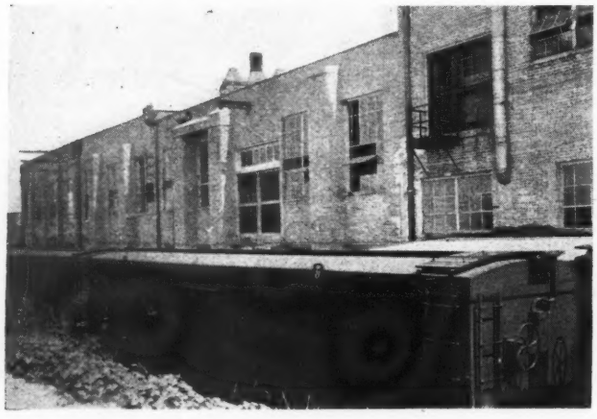
By HAROLD G. WIELAND
Production Manager, Wieland Dairy Company, Chicago

IN THE systems and equipment for materials handling in a dairy is found the largest item of cost outside the milk itself, and in the economical or uneconomical solution of these handling problems is found the principal source of profit or loss to the business. Milk is a fluid and, as such, can be handled with surprisingly low cost in pipe lines and pumps. But, unfortunately, the distance which milk travels in pipes is trifling compared to the distances it must travel in tanks, cans, or bottles in cases, and in most of these instances the handling problem is one of transportation rather than mere intraplant materials handling. It is a problem of handling bulk liquids or packages, and differs from similar problems of other branches of the food industry only in the extreme perishability of the product. Everything in the dairy industry must be kept cold—below 50 deg. F.—to prevent spoilage.

Five phases of the transportation problem are found in the industry: From farm to country receiving station or direct to the city dairy; from receiving station to city

Fig. 2—Milk is hauled to the pasteurizing plant in the city, from country receiving stations, in insulated tank trucks and trailers. When cooled in the country to 38 deg. F., it can be hauled safety up to 75 miles

Fig. 1—Tank cars are used for transporting milk to the city from country plants when distance or other factors make the tank truck unsuitable



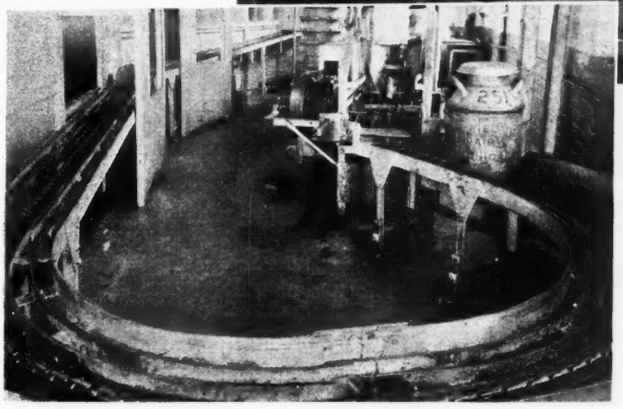


Fig. 3—One of the conveyor loops upon which 10-gal. cans of milk are received and automatically dumped after the cover has been loosened by hand

Fig. 4—Ten-gallon milk cans, brought in by truck, are here dumped, cleaned, and returned to the truck that brought them, all automatically (Picture taken before room was completely walled in

dairy; transportation of bottled goods from the dairy to its distributing branches; delivery of the milk to the consumer; and, in addition to all these, the conveying problems within the plant itself. Actually, however, the transportation problems are handled in the following manner:

1. Refrigerated trucks, owned or chartered by the dairy company, pick up the cans of milk, at country crossroads, or along the main highways, and haul them direct to the city dairy if the distance be not too great. The maximum radius of economic operations here is considered by the Wieland Dairy Company to be 40 miles. At the dairy the cans are at once dumped, washed, and sterilized, then immediately replaced in the truck and returned to the farmers.

2. Another procedure, used in the producing areas that are more distant than those in the first instance, is to haul the milk from farms to a country receiving station in exactly the same manner, but, after dumping, the milk is cooled to 38 deg. F., pumped into an insulated tank truck and hauled to the city plant (see Fig. 2). The maximum distance for this form of transportation is 75 miles, but road conditions are an important modifying factor.

3. Still another procedure involves a large centralized country receiving station that is a factory in itself, for it is equipped with refrigerating machinery, milk drying machinery, and cream separators. Milk is received here from the farms by the same method as first given, but only enough of it is sent to the city to fill the orders originating there. Transportation of milk from this plant is usually by tank cars, shown in Fig. 1, although the decision as to when to ship by tank truck or when to use the tank car is not always an easy one to make.

In general, it may be said that whenever a sufficient volume of milk is concentrated at a shipping point the tank car should be used, provided the distance is great enough. However, with the steady improvement of roads throughout the country, particularly the hard-surfaced roads, the tank truck has an increasing radius of economic operation, and the tank car is economical only in the outer zone. This zone today begins about 75 miles from the city, but cannot be regarded as fixed.

All of the rest of the milk, above that which is ordered into the city, is kept at the country plant and converted to the best uses possible. Cream may be separated, put in 10-gal. cans, and sent to the city for sale as bottled cream or milk, or it may be put in 5-gal. containers and frozen, to be kept in freezer storage until it can be sold with a minimum of loss; the skim milk is either converted into evaporated skim milk, powdered milk, cultured milk, sold as skim milk, or occasionally is manufactured into casein. Another method of utilizing surplus milk is to manufacture it into whole evaporated milk, powdered whole milk, whole milk, or cheese, without separating the cream. In case the quantity of cream accumulates too greatly, it can be manufactured into butter.

But it must be borne in mind that all of these operations are conducted at the centralized country receiving plant and are not a part of the operations of the city plant, although they are of vital importance to it, for the reason that the country plant of this type is the reservoir or place where the surplus is handled. The city plant is never permitted to have a surplus. The Wieland company has such a country plant at Adell, Wis.

The necessity for all these country manufacturing operations is found in two important aspects of the dairy business. Contracts are made with farmers for the output of their herds, and this varies somewhat with the seasons and more so with the condition of rainfall and pasturage. Also the consumer demand fluctuates quite markedly from day to day depending on the following factors:

1. Weather conditions, for people drink more milk in hot weather than in cold weather.

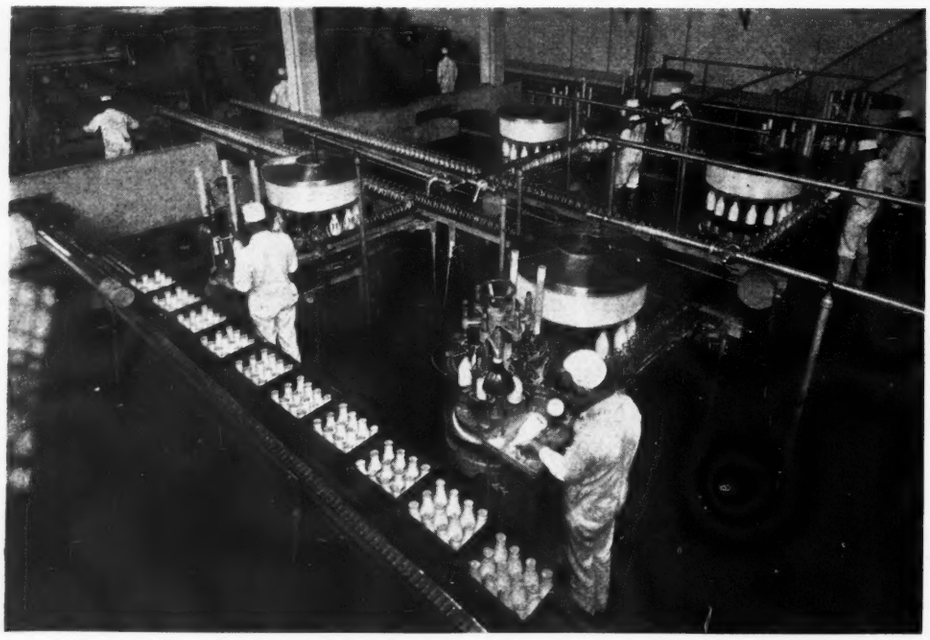


Fig. 5—In this filling room the clean bottles are received from the washer by conveyor and automatically filled. After inspection, the filled bottles are placed in the cases moving along the conveyors adjacent to the filling machines

2. The day of the week, for more milk and cream are used on Sundays and holidays than on other days.

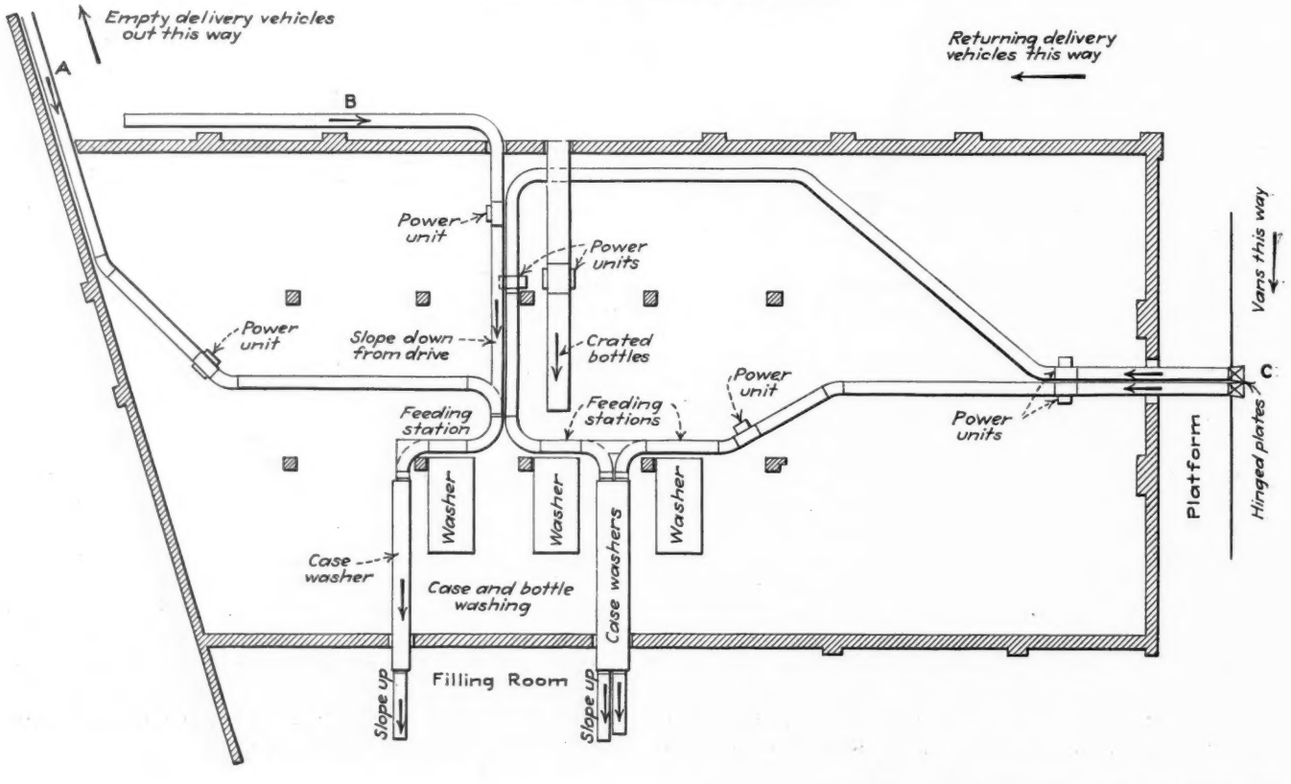
3. Whether or not people are at home or on vacations.

4. The financial status of the family which, in turn, depends on general economic conditions.

All of these features have been brought out because they have a bearing on the transportation problem. As we have worked it out, the milk from the country stations other than Adell is all brought to the city regularly by motor truck or tank truck. The Adell plant functions as the reservoir to make up whatever volume is needed in the city and all its milk going to the city is transported by railroad tank car, such as those seen in Fig. 1. This company, we believe, was the first concern to use the insulated railroad tank car and the first three cars which were purchased back in 1920 are still giving excellent service, although certain modifications have been made in them, as might be expected of any such experiment.

Upon arrival at the city plant the tank cars are unloaded by blowing the milk out of the cars by means of compressed air. A centrifugal milk pump is placed in the line, however, at the second floor to boost the milk

Fig. 6—Diagrammatic layout of the conveyors in the basement of the Wieland Dairy Company's Chicago plant



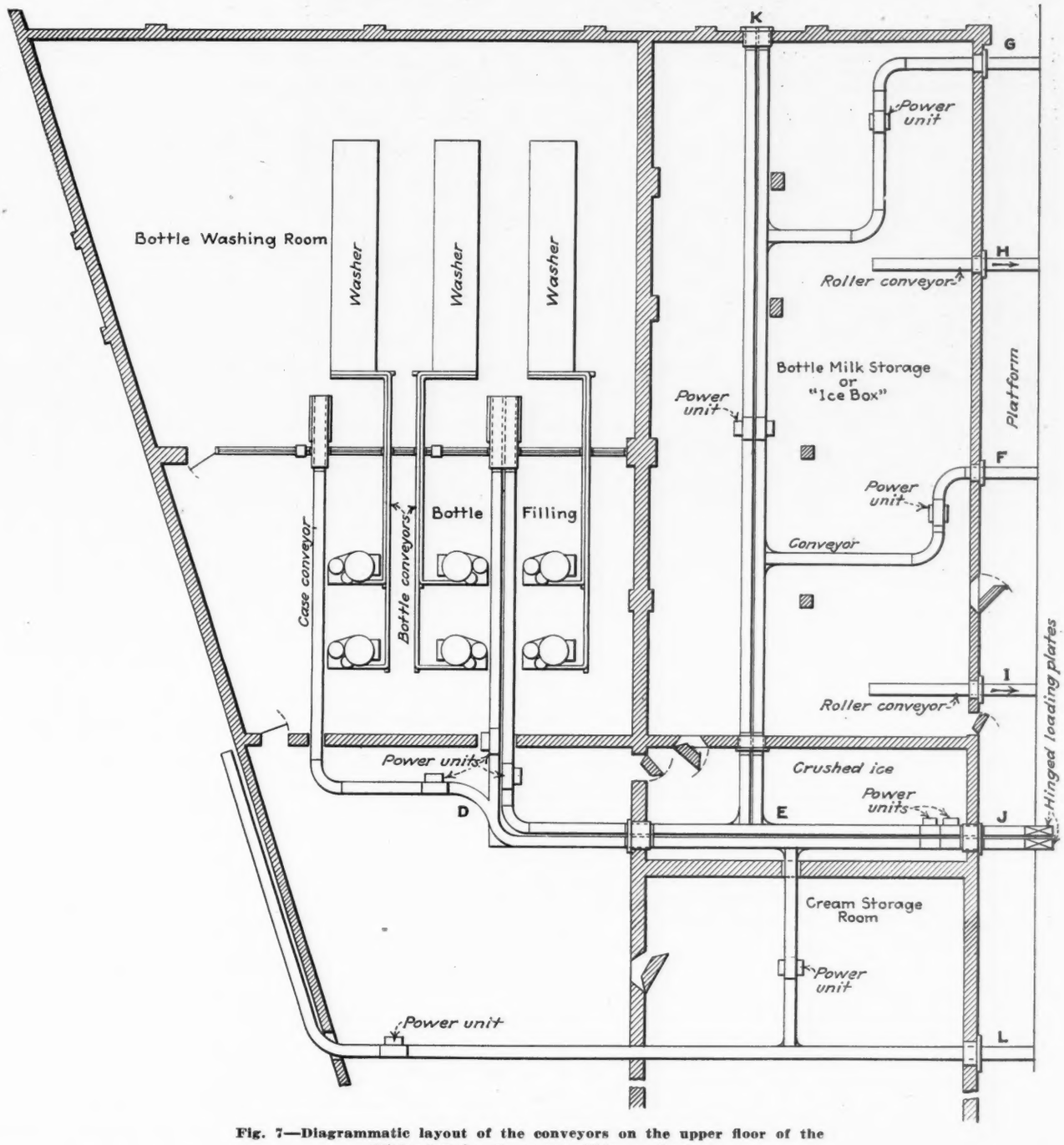


Fig. 7—Diagrammatic layout of the conveyors on the upper floor of the Wieland Dairy Company's Chicago plant

along and avoid the use of excessively high pressures in the tanks of the tank car.

Tank trucks are unloaded by gravity. From them the milk flows into a centrifugal pump that delivers it to the same weighing room to which tank-car milk is delivered.

So-called can milk in 10-gal. cans is received in a separate place, shown in Figs. 3 and 4, where cans are dumped, washed, sterilized, and the milk pumped to storage tanks. An interesting materials handling problem is involved in this particular receiving department. The compactness of the unit can hardly be exceeded. Cans are dumped, cleaned, and returned to the truck which brought them in entirely automatically except for knocking the can covers loose and pushing them over in the dumping cradle. This department receives 110,000 lb. of milk daily and handles it at the rate of 30,000 lb. per hour. The space is roughly a triangular area, as can be seen in the illustration, about 45 x 20 ft. in its longest dimensions.

Virtually all of the milk handling in the plant from the receiving plant to the bottling machine is done by pumping. After filling the bottles the handling is done by Mojonnier Flextype conveyors. In Fig. 5 the handling problems are clearly depicted. From the washers the bottles are conveyed on a Meyer conveyor to the automatic fillers. Operators lift the bottles off, invert them to inspect the bottoms for any improperly washed bottles, and deposit them in the cases which move past the machines on the flexible chain conveyor. Individual bottles are not handled again until the delivery man leaves them at the consumer's home.

The layout of the whole conveyor system is shown in

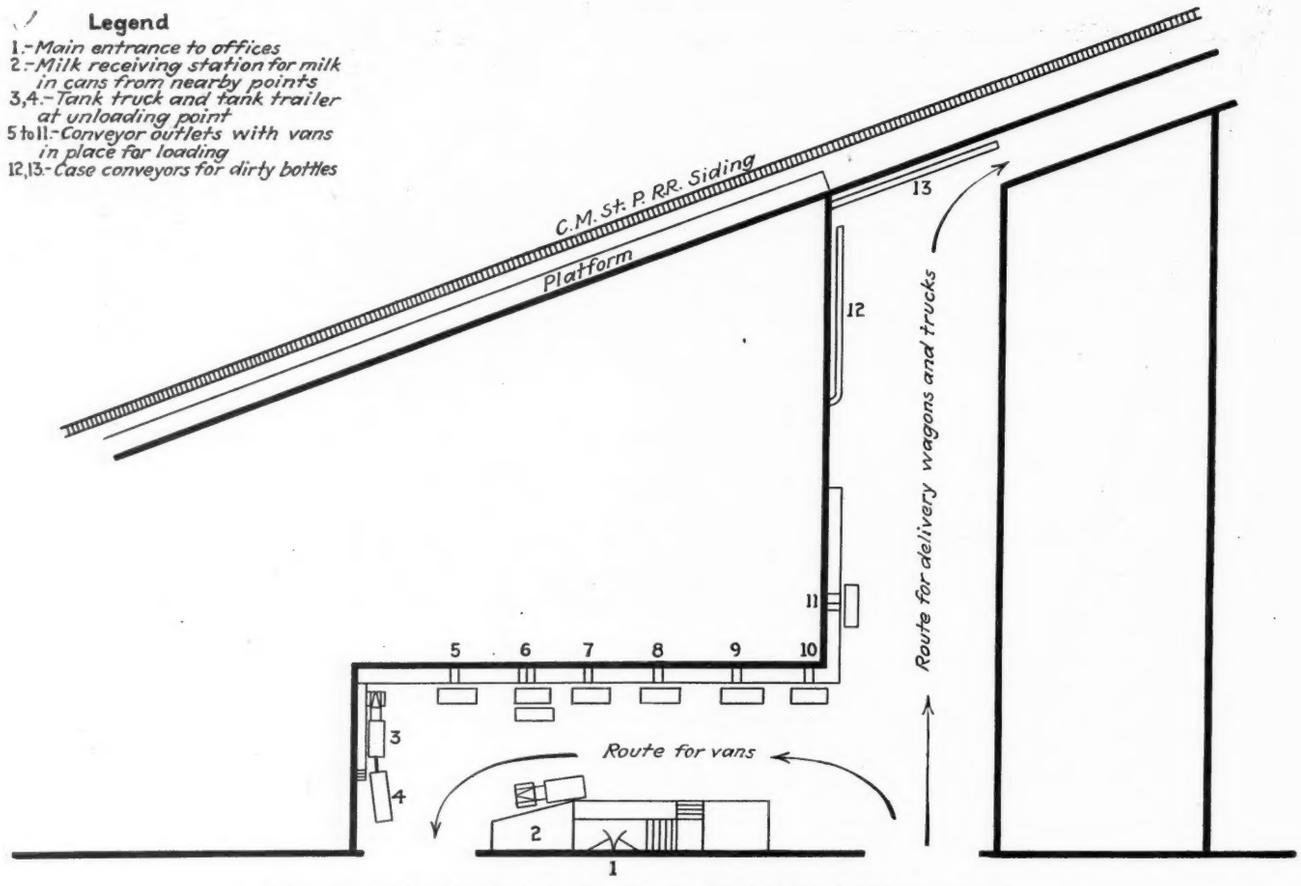


Fig. 8—Sketch showing the location of the interior driveways on the lower floor of the Wieland Dairy Company's Chicago plant, by means of which trucks and delivery wagons reach the loading and unloading stations

Figs. 6 and 7. On account of the fact that the conveyors are on two different floors, it is necessary to show them separately. When cases of dirty bottles are returned by deliverymen they are unloaded at points *A* and *B*, directly onto the conveyor, which takes them to the bottle washers, where the operators place the bottles in the pockets of the washers. The movement of the case is temporarily arrested by a treadle release brake until it has been emptied. The advantage of the flexible chain conveyor lies in its ability to flex sidewise as well as slip under any object that is firmly held upon it. When released, the empty case moves automatically through the case washer and thence upward on an elevating conveyor, passing the filling machines as shown in Fig. 7 (upper floor).

When dirty bottles are returned from the outside distributing branches the vans stop at point *C* and unload. The flow of cases and bottles here is easily traced on Fig. 6 (lower floor).

Filled bottles are placed in cases on the conveyor, which then takes them into the "ice box." It will be noted that at point *D* (Fig. 7) two conveyors join into one. To avoid stoppages at this point the device shown in Fig. 9 automatically regulates the traffic, stopping one side or the other by applying the compressed air-operated brakes shown in the illustration. This permits one conveyor to do the work of two from this point onward. From the fillers the bottled milk in cases is

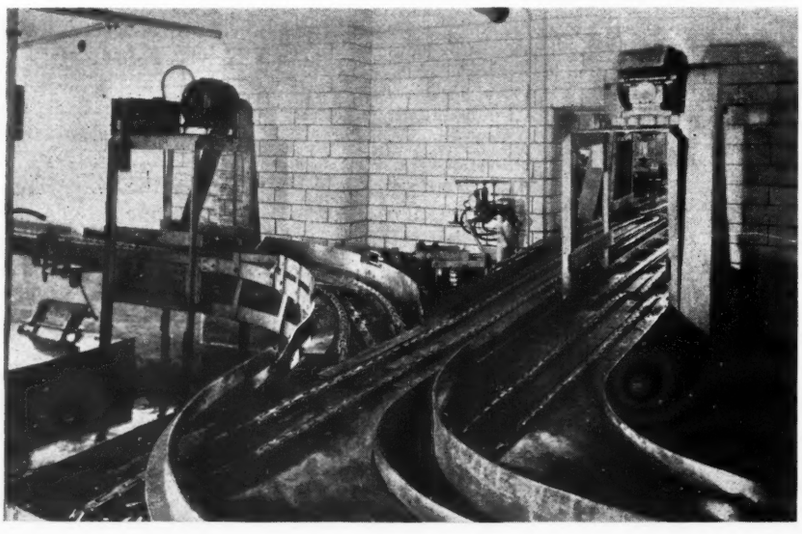


Fig. 9—An automatic device regulates the traffic where these conveyors join by applying compressed air-operated brakes

conveyed to the "ice box" or storage room. A shovelful of chipped ice is placed on each case of bottles as it passes point *F* (Fig. 7). The subsequent movement of the cases is controllable at will to *F,G,J,K,* or *L* for loading into vans (insulated trailers).

All milk that leaves the plant goes out in vans, even the milk for delivery from the branch which is located at the plant. This is one of the steps in our materials handling arrangements that has a very important bearing on economy and will be discussed more fully a little farther on. In case the bottled milk is to go into temporary storage at the plant it is set off onto the floor at any convenient place within the storage room.

If by any chance drivers bring back any bottled milk, or other goods which we sell, at the end of their day's trip they put it on one of the chain conveyors at points *G,* where it is checked in and put back into storage. In this case the direction of travel of the conveyor is reversed, to bring it into the plant. The amount of route returns usually is less than one or two cases.

One extremely important feature of the flexible chain conveyors is their reversibility. They can run equally well in either direction and carry a full load either way. All of the conveyors in the "ice box" are equipped with reversing switches, and this reversibility greatly facilitates the movement of goods.

Roller conveyors are found in two places in the "ice box" at the present time, and they are used only during the rush hour periods for loading goods out.

The Wieland company sells a large quantity of cream in 10-gal. cans which are stored in a separate "ice box" shown in Fig. 7 and, when loaded out, move on the conveyor to point *L*. Intercommunication of conveyors is shown in the diagram, whereby the bottled cream can be shunted off from the conveyors that are transporting bottled milk. It will be observed that the cream conveyor extends out to the rear of the building onto the railroad platform. Cream in cans arriving from Adell or other points by rail is set off onto this unit, shown in Fig. 10, and can be brought into the cream weighing room or carried past it into the cream storage room, depending on the immediate needs.

In using this type of materials handling system practically all of the heavy jobs have been eliminated and the amount of labor required to handle this phase of plant operation is reduced to about as little as can be used to supply the intelligence necessary to supervise loadings.

The radical departure from traditional methods made by this company a few years ago was made possible by the development of new equipment, not the least of which is the motor truck and trailer. In fact, the trailer is the basis of our whole distribution system. All bottled milk from the storage room is loaded into "vans" or trailers with insulated bodies, with chipped ice sprinkled generously over each case. When the van is filled and the doors are closed they then become portable refrigerator storage rooms. Tractors haul them in trains or singly to the four city "branches" (see Fig. 11). A "branch" is a separate distributing unit as contrasted to the processing plant. At the plant is a branch which operates quite independently of the plant, although located on the same property.

Fig. 10—Cans of cream are unloaded onto this conveyor, which delivers them to the cream-weighing room or to storage, as desired

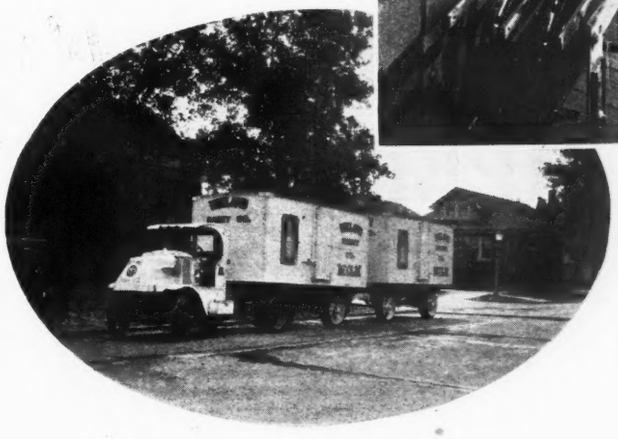
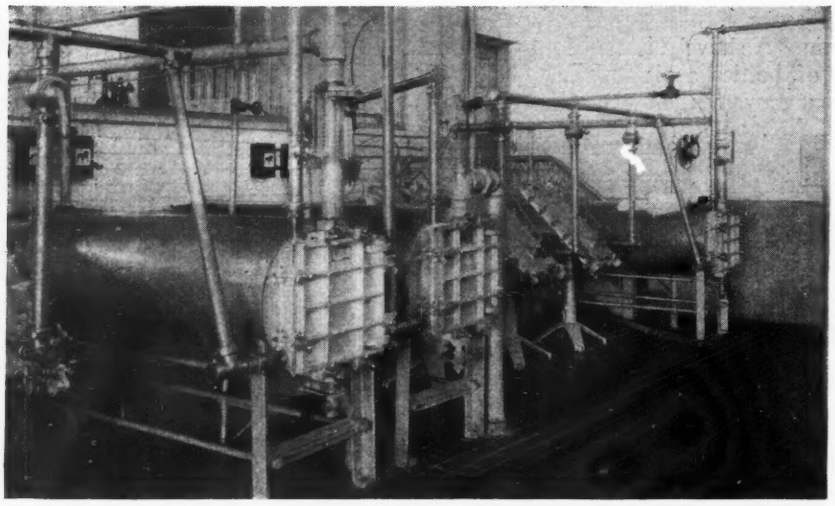


Fig. 11 — Gasoline tractors haul trains of refrigerated vans from the city dairy to the distributing branches situated in convenient parts of the city

In the illustration on page 435 are shown a number of vans that were loaded in the afternoon, hauled out on the street, and left there until loading the delivery wagons or trucks in the early morning hours. All loading of major items to delivery units—wagons or trucks —is made from the vans; the miscellaneous items are loaded from branch storage coolers.

This system of utilizing the van has been one of the greatest economies that has been instituted in this business. A large number of vans are in constant use without a corresponding number of automotive units, a fact that enables us to keep down the capital investment. They are always ready to be hauled anywhere, and should a sudden need arise at any point a load is available. A further economy is found in the greatly increased storage space which they afford. If an equivalent storage space were provided in a building it would necessarily be so compact that only a few vehicles could approach it at a time, and the working hours devoted to loading the delivery vehicles would be greatly lengthened.

Still another economy which our system affords is the comparative absence of temporary storage in the plant. Everything possible goes straight through the plant and into the van, thus maintaining our cardinal principle, "keep moving."



The milk heaters at the Wieland plant are of the "barrel" type. The 4-in. pipe is the 145½ deg. water supply

Solving a Difficult Problem of

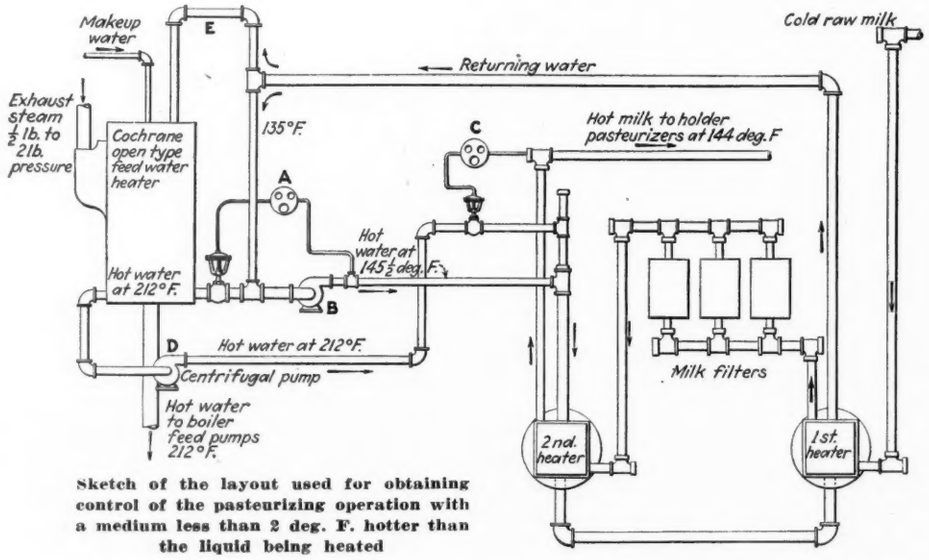
TEMPERATURE CONTROL

By JOSEPH ALLWEILER
Chief Engineer, Wieland Dairy Company, Chicago

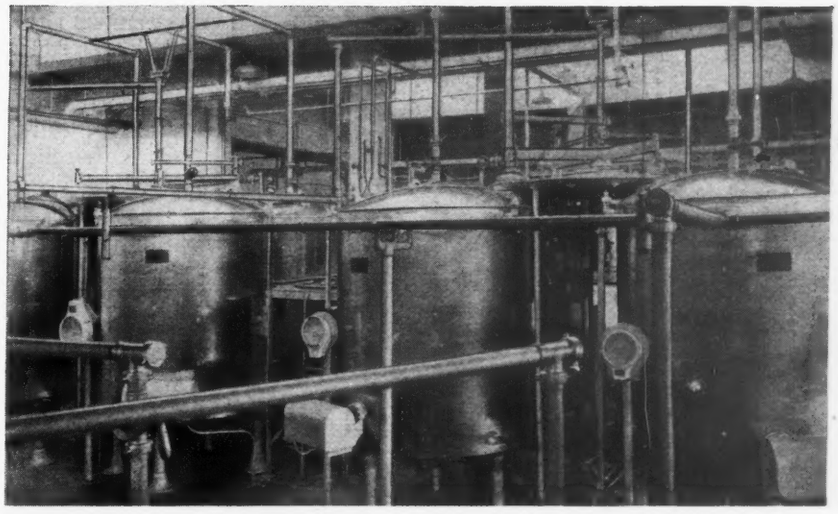
SUCCESS in the use of exhaust steam in a dairy for processing depends largely on the accuracy with which the process temperatures may be controlled. Until the problem of close control has been solved, the economies of byproduct steam will be offset to a large extent by worries over fluctuations of temperature, in case the heat in the exhaust steam is to be used for pasteurizing.

When the Wieland Dairy Company decided, in 1928, to revamp its equipment, and certain of its methods, the problem of temperature control was submitted to several concerns, all of whom were of the opinion that it would be impossible to control the temperature of the milk at 144 deg. F. if the proposed plan of operation were adhered to. The difficulty lay in the fact that Wieland desired to use regenerative cooling, with milk against milk, a problem which was further complicated because the temperature of the hot milk was constantly 144 deg. F., while the temperature of the cold milk to be heated might vary between 36 and 45 deg. F. These variations would be occasioned by the fact that milk from factory storage tanks would be coldest, while milk arriving in tank cars, in tank trucks, and in 10-gal. cans direct from farms, would be increasingly warmer. A temperature-control system was required that would be able to accommodate itself to all these changing conditions of temperature of incoming raw milk and at the same time heat the milk to 144 deg. F., with regenerative cooling, without noticeable deviations from that temperature.

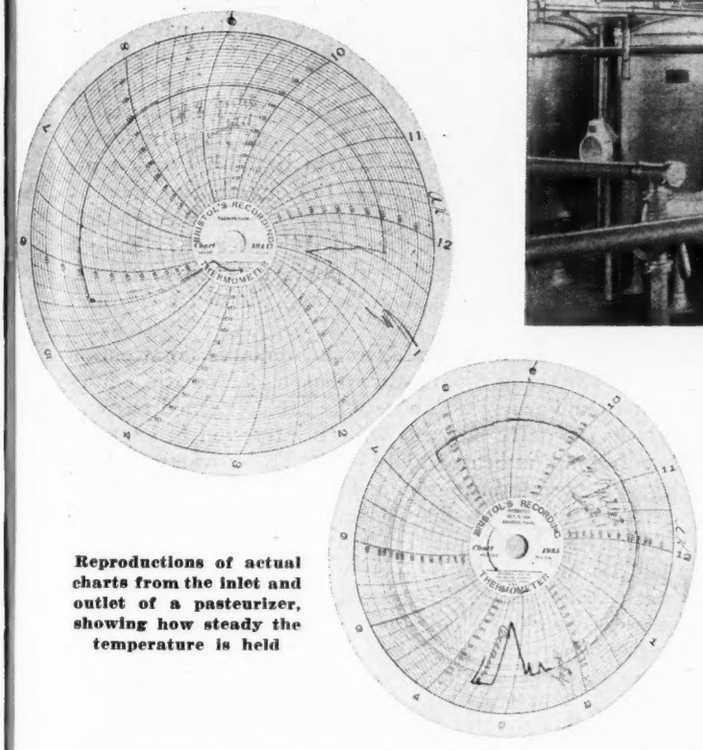
Perhaps it should be explained that pasteurization by the holding method, as defined by local health regulations, consists of heating milk to 144 deg. F., and holding it at that temperature for exactly 30 minutes. Performing this operation is very exacting, for if the temperature goes higher the quality of the milk is somewhat impaired, the volume of cream is diminished, and



Sketch of the layout used for obtaining control of the pasteurizing operation with a medium less than 2 deg. F. hotter than the liquid being heated



The pasteurizers are jacketed, cork-insulated tanks covered with Alleghany metal and equipped with recording thermometers



Reproductions of actual charts from the inlet and outlet of a pasteurizer, showing how steady the temperature is held

the consumer appeal that depends on these factors is seriously curtailed. Furthermore, if the temperature falls below that figure, the plant is in trouble with the health authorities for failure to live up to regulations. If the 30-minute holding period is exceeded, the effect upon the quality of the pasteurized milk is adverse and hence it is extremely desirable to cool the milk as promptly as possible to 38-40 deg. F., in order to preserve quality and to prevent the development of bacteria during the period when it is changing from pasteurizing temperature to bottling temperature. In changing from 144 deg. F. to 40 deg. F. the milk must necessarily pass through intermediate temperatures that are ideal for rapid bacterial growth.

Various acceptable methods of cooling the milk are available, but, in principle, all depend upon bringing the hot milk in contact with a cold metallic surface that is constantly chilled by the cold liquid on the other side. The heat flows to the cooling medium and may be lost entirely except when an effort to save it is made. This may be done by employing the principle of regeneration, in which the cold raw milk en route to the heaters is passed through an apparatus in which it may absorb the heat from the hot pasteurized milk. Such an operation performs the double function of effecting a very considerable saving of heat and of relieving the heating units of a portion of their burden by bringing the milk to the heaters at a higher temperature than it has been previously.

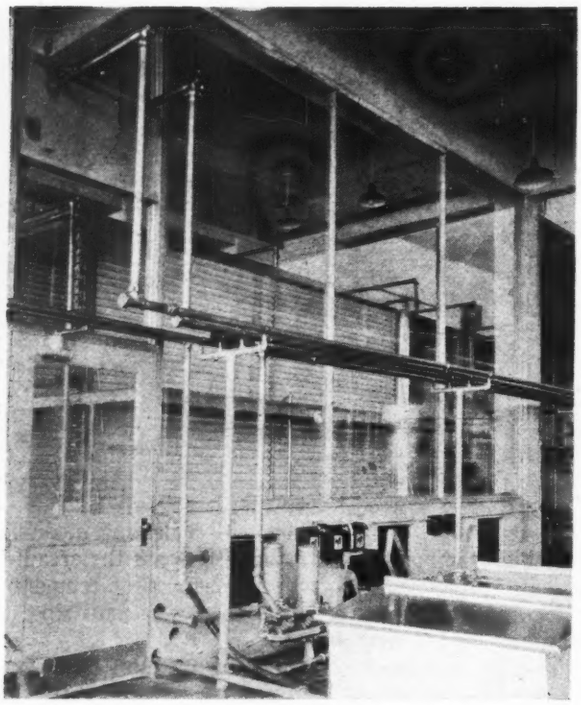
Regenerative cooling, it should be explained here, has a value not only for heat economy but also has a definite relation to the apparent cream volume of the milk. The cream line in milk may be almost totally destroyed either by temperatures exceeding the pasteurizing temperature by 5 or 10 deg. or by contact with a heating medium of very high temperature. In the latter case the cream-line destruction occurs even when the apparent temperature of the milk never exceeds the correct pasteurizing temperature of 144 deg. F.

Therefore the use of a heating medium of as low a temperature as possible is necessary. Regenerative heating in this installation raises the temperature of 40-deg. F. milk to approximately 125 deg., thus leaving only a 19-deg. temperature rise to be accomplished in the final heaters. Under this condition the temperature of the heating medium need only barely exceed 145½ deg. F. to impart a temperature of 144 deg. to the regenerated milk, but its volume must be much greater than the milk. With this exceedingly small temperature differential the cream line is not affected and no formation of milk stone occurs in the heater.

Heating of the partially warmed raw milk to the pasteurizing temperature is the process where accurate temperature control is necessary. No great problem is involved in its control except where there are marked variations in the temperature of the cooling liquid, which, in this case, is the raw or unpasteurized milk. And, because the hot milk leaving the heaters must have an absolutely constant temperature of 144 deg. F., irrespective of fluctuations of incoming temperatures, the problem at the outset became one whose successful solution was regarded skeptically.

Common sense indicates that without adequate reserve heating or refrigerating capacity the accurate control of temperature by automatic methods is impossible. In our experience, the gradual evolution of a successful control system to meet the conditions in this plant was a combination of better applications of heat and the use of dual temperature control. As is explained elsewhere in this issue (page 440), the medium of heating the milk is by the use of hot water.

In the accompanying diagram of the method of control that was ultimately adopted, only controller *A* and pump *B* were first employed. The plan was to draw 212-deg. water from the heater through an automatic temperature controller which was set at 145 deg. F. After circulating through the two milk heaters it would return to the heater or to the centrifugal circulating pump at 135 deg. F. It will be observed that before the water can return to the heater it must pass through the vertical upward loop *E*, which is a very important feature. If this loop is absent the returning water may pass directly to the feed water heater without flowing back



The milk coolers are entirely inclosed in glass. The upper construction of the room, of hooded type, opens to an exhaust fan. Note the milk pumps in front of the glass partition

to the pump in sufficient quantities to satisfy its demand, thus breaking the suction. Its absence thus may have the further effect of being the indirect cause of fluctuating hot-milk temperatures.

Heating by hot water with the *A–B* units alone, however, was not very satisfactory. In general it worked fairly well, but was too slow in its action. When the temperature of the inflow of cold raw milk changed suddenly the controller would act only after the hot water had circulated all through the system of heaters and had returned to the control point, a fact that allowed a certain period of time to elapse before it changed to meet the new condition. Also, the same criticism would hold if the sensitive element had been placed in the outflowing milk stream. Obviously, the remedy was a system of secondary control so arranged that it could act instantly to take care of the momentary fluctuations and permit the recording of a constant temperature on the holding tanks—the ideal of any dairy and a condition that health regulations require.

Secondary control was accordingly installed at *C–D*. A second centrifugal pump brings boiling water to the inlet of the first heater, where an automatic control valve admits it whenever it is required. The sensitive unit of this controller is located in the line of hot milk going to the holding tanks. In a sense this secondary controller is an emergency unit and functions only occasionally, but it is always ready and will correct any minor temperature fluctuation instantly, while that at *A–B* will require about one minute.

It will be seen at once how necessary it is to have adequate quantities of boiling water on hand in order that the controllers may have an ample reserve with which to work. And for this reason, back of all these control instruments is another control unit, a Fisher governor, which insures a supply of hot water at all times in case the exhaust steam should be cut off by accident or otherwise. This steam governor turns live steam into the exhaust line if the pressure falls below ½ lb. per square inch and shuts off the live steam when the pressure is up to 2 lb. per square inch.

When the day's work begins the heaters and all pipe lines are full of cold water. The operator sets the temperature controller of the *A–B* unit at 155 deg. F. instead of 145½ deg., and maintains this setting for the first half hour of operation. This is because the pasteurization period is 30 minutes and until completed there will be no hot milk for regenerative cooling. The burden upon the heaters during the initial period requires the heating medium to be at 155 deg. F. at its entrance to the counter-current heating system if the hot-milk temperature is to be maintained at 144 deg., but as soon as the first holding period is over the operator resets the *A–B* unit for a temperature of 145½ deg. F. Except for those periods when other products, such as cream, are being pasteurized, the setting of the *C–D* unit remains unchanged.

The system works perfectly and requires no attention other than the ordinary care that all automatic equipment should receive. Those who are concerned particularly in the dairy business will be interested in knowing that the milk is heated to 144 deg. F., by water at 145½ deg. F. except during moments of sudden fluctuation, and that this is possible of accomplishment by the circulation of a quantity of the heating medium much larger than the milk. The ratio of water to milk is approximately 3 to 1. The differential of about two degrees of temperature can be cut down slightly by increasing the ratio. In some systems of pasteurization the ratio of hot water to milk is said to run much higher, but at this plant the 3 to 1 ratio has been found satisfactory. Increasing the ratio would effect further accentuating of the regulating ability of the *A-B* control unit and tend toward lessening the necessity of the *C-D*, or secondary, control unit. But it hardly seems possible to do away with the secondary control entirely, without a hot water to milk ratio that will be in the vicinity of 9 or 10 to 1. And if such a ratio were employed it would necessitate the use of a centrifugal pump and motor of four times the capacity of those now in use on the hot-water lines at this plant and equipping with large piping.

An unusual method of regenerative milk cooling, with the hot, pasteurized milk on the outside of the tubes, is carried out in the cooler shown in this sketch

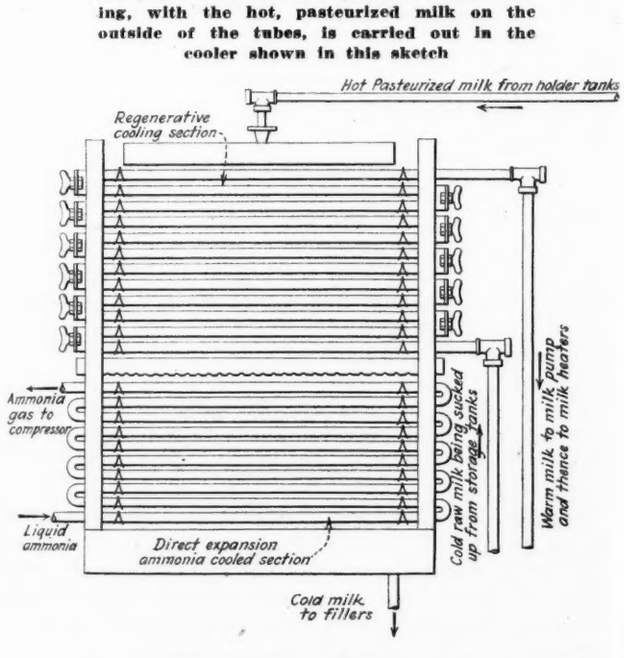

Hot Pasteurized milk from holder tanks
Regenerative cooling section
Ammonia gas to compressor
Liquid ammonia
Direct expansion ammonia cooled section
Cold raw milk being sucked up from storage tanks
Warm milk to milk pump and thence to milk heaters
Cold milk to fillers

Fig. 1—This view of the reception room of the Wieland plant shows the large windows through which the visitor can view the operations of milk preparation

Looking at the Important Details of PLANT DESIGN

EDITORIAL STAFF ARTICLE

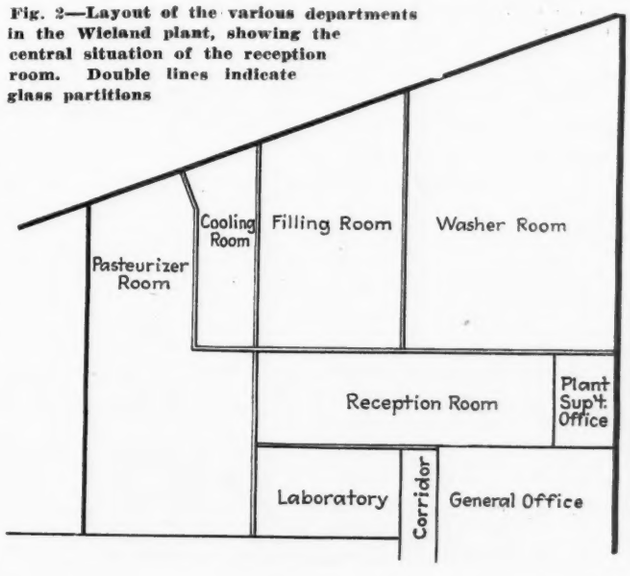
MANY building features of the Tripp Avenue plant of the Wieland Dairy Company, in Chicago, of which William F. Pagels was architect, will interest the experienced production man. While some of them merely add to the attractiveness of the plant, others are more practical details that make for convenience, efficiency, or sanitation. Visitors, for example, are shown into the reception room, where the laboratory and the essential operations of pasteurizing and bottling milk are visible through the large plate glass windows that are shown in Fig. 1.

This great range of visibility is possible through careful arrangement of the several rooms, bringing the reception room into the center of operations. The bottling and filling rooms, shown in Figs. 2 and 3, are two stories high, and as the spectator in the reception room is on the second floor he can oversee all operations below.

Floor Drainage—Probably the first thing that the factory-minded visitor notices is the floors, for, contrary to usual practice, not only in dairies but also in most canning plants, pickle plants, and nearly all others where wet manufacturing is conducted, the floors drain to the sides and not toward the centers of rooms or bays. When water drains to the center of an area of floor space every person passing through the room will walk in the deepest water, because men instinctively walk in the widest spaces. Accumulation and removal of refuse in center drains also is a very disagreeable feature that is remedied by side drainage.

Drainage to the side also has other advantages than making the floor space less wet. If one considers the problem of the drain pipes themselves, underneath the floor, particularly if the floor is above the basement or ground floor, it will be readily seen that the downspout must be carried to the nearest wall or column, or else the pipe itself will obstruct the working space in the floor

Fig. 2—Layout of the various departments in the Wieland plant, showing the central situation of the reception room. Double lines indicate glass partitions



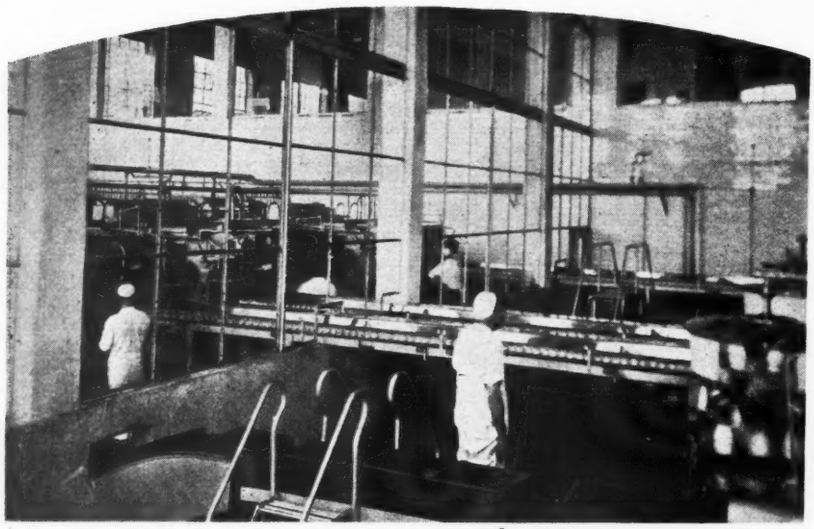


Fig. 3—In this view, taken in the filling room, the outlet of the bottle washers is visible beyond the glass partition on the left

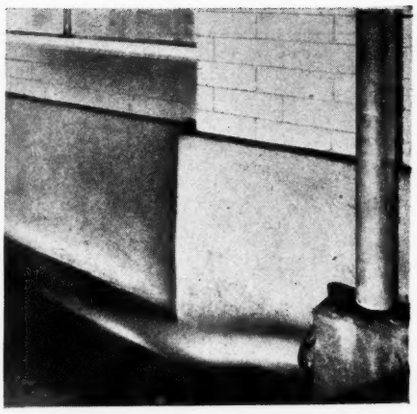


Fig. 4—The discharge opening of a downspout from the floor above empties into a gutter adjacent to a drain opening, as shown in this photograph

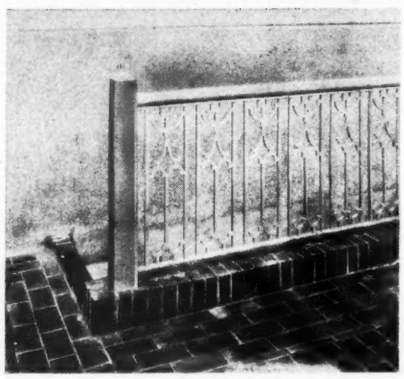


Fig. 5—Special brick construction around a stairwell prevents water flowing down the stairs

below. The two ideas expressed here are shown in Fig. 6.

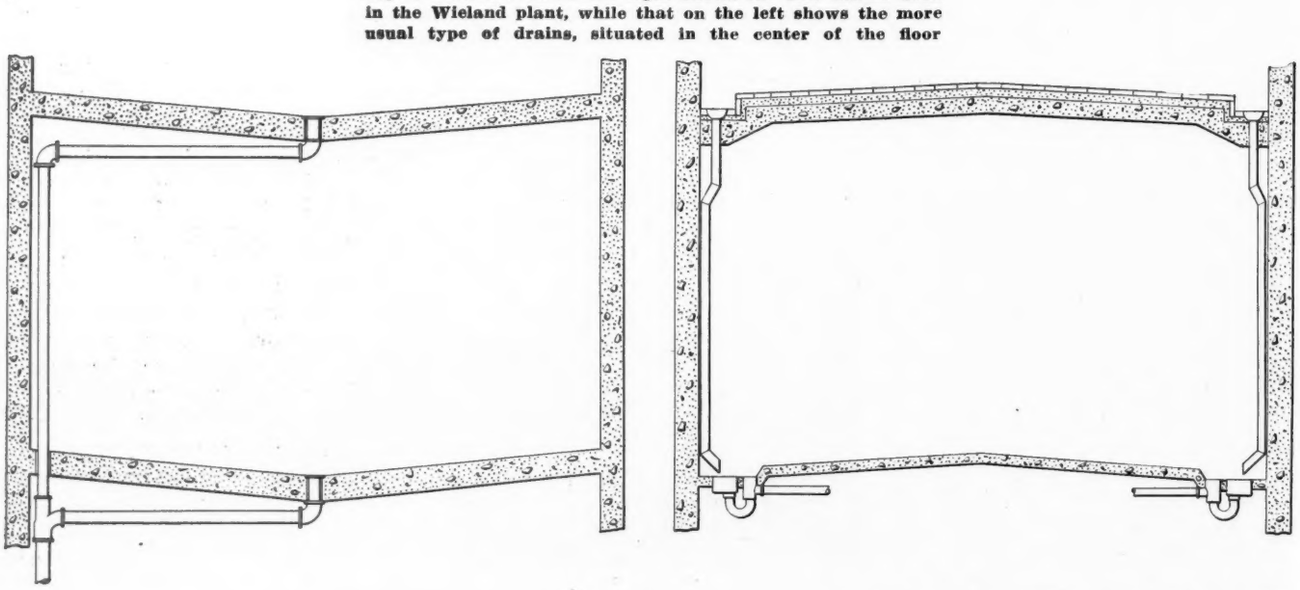
At Wieland's the gutters from each floor discharge through Josam drain fixtures to downspouts and thence to the gutters in lower floors. A section through a gutter is shown in Fig. 7. Discharge openings are placed in such a way that the falling water will pass fairly directly into the next lower downspout, much after the manner of Figs. 4 and 16. It is very important to have the lower ends of the downspouts properly anchored, as in Fig. 4, for if they are left dangling or loose it is only a matter of time until they are knocked away from their suspension above, and then they will leak water at the joints. Floor gutters are constructed of the same material as the floor itself. The trap used with these drains, also of Josam manufacture, is shown in Fig. 8.

In a few instances the downspout is contained entirely within the wall itself, and the drain and trap are set into a recess in the wall. This is an older method, however, that is not quite as satisfactory, and has been replaced in the more recent construction by the fixture at the bottom of the gutter.

Only one stairway leads down from a wet floor: that shown in Fig. 5, located in the washer room. The method of flashing the stairwell with brick to prevent any water running downstairs is excellent and seems to follow the general lines that are found in flashing stairwells in marine practice, except, of course, that the material of construction is different.

Secondary floor drainage is provided around the bottle washing machines as shown in Fig. 9. The base of the machine can also be seen in the photograph on page 458. Bottle washing is done with the aid of strong caustic soda and the slop and overflow constitute a distinct menace to operators. Alkali will not only ruin shoes but

Fig. 6—The sketch on the right shows the side drains used in the Wieland plant, while that on the left shows the more usual type of drains, situated in the center of the floor



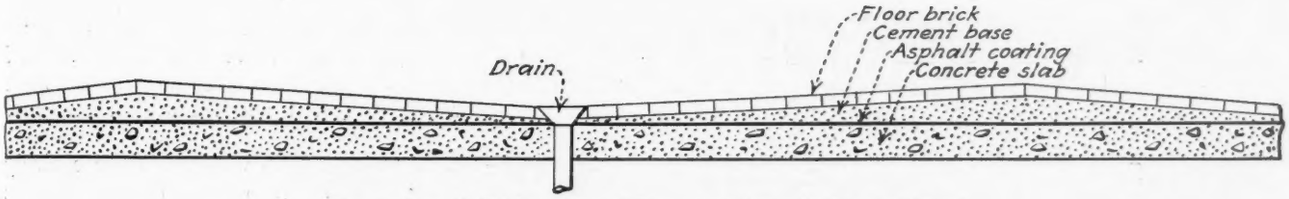


Fig. 7—Longitudinal section of floor at gutter, showing method of construction employed to obtain pitch to drain

makes both rubber and leather very slippery, thus creating a safety hazard. To allow these caustic solutions to flow over the floors is a needless procedure that Wieland has obviated by providing drainage of the machine base itself. Water that gets onto the floor in other ways is not harmful and drains away in the normal manner.

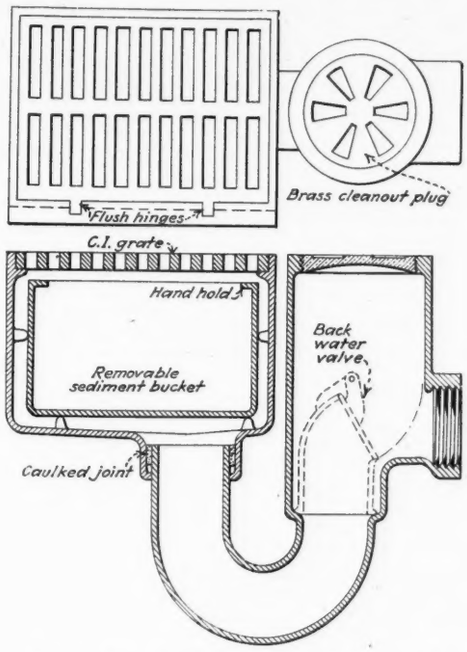


Fig. 8—The drain and deep-seal trap used in the Wieland plant are shown in detail in this sketch, which clearly indicates the provisions for keeping the trap in operation

Floor surfaces in most of the departments are special brick laid with shoved joints in a grout, as shown in Fig. 7.

Floors and Machine Foundations—In planning the plant the designs were carried to the limit before construction began. Every machine was located on drawings before the contract was let, a procedure that is no more than should be expected but one that all too frequently is omitted. Machine foundations were built in with accuracy, and when the equipment finally was set up, there was no need of any chipping or filling. Fig. 10 shows a filler machine base that is a decidedly workmanlike job. This same view shows another important detail that might escape the casual observer: The working space in front of the machine is raised and also is a level place on a sloping floor. This raised platform obviates the use of unsanitary, miscellaneous boards to keep the operator up out of the water and, more important than this, it gives the operator a level surface on which to stand and raises him to a convenient level with respect to the machine (see Fig. 16). Only one who has stood for hours on a sloping surface can realize the relief that a level surface affords.

Careful planning for machine foundations also was necessary, in order to install the waterproof power conduits that rise through the floors of many rooms to the motorized machinery. All this conduit had to be laid before the concrete was poured, and if machine settings had been left till the last the result could hardly have been satisfactory.

Another feature of the floors that deserves comment is their very heavy construction. Planned to carry a load of 350 lb. per square foot, the floors are capable of holding any of the equipment that could be used in this type of plant. In contrast to this are occasional plants

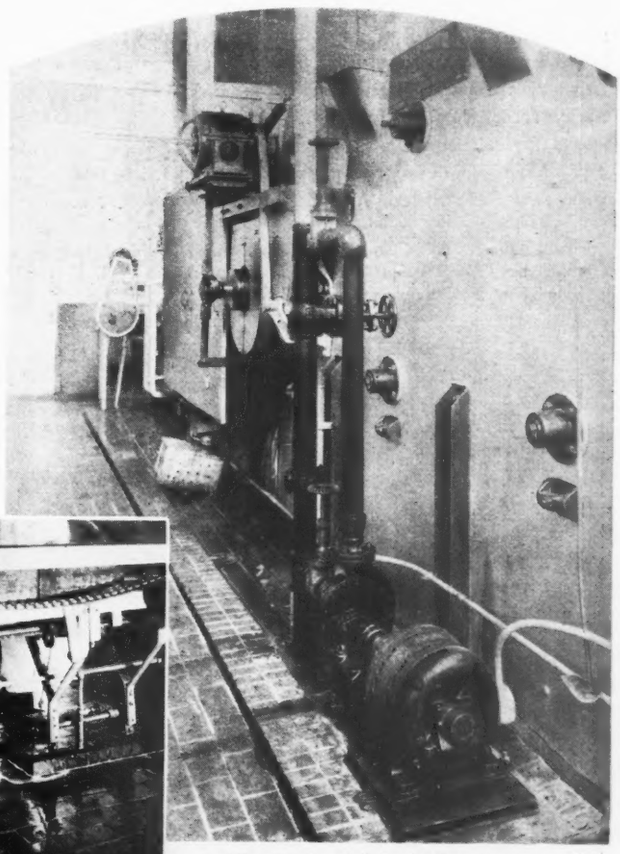


Fig. 9—Special drainage arrangements made around the bottle washers

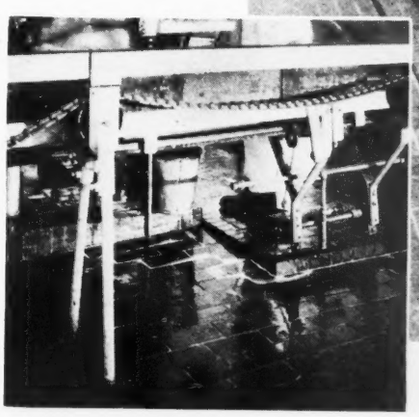


Fig. 10—Machine bases have been carefully constructed in the Wieland plant, as shown in this photograph, which also shows one of the permanent, raised, level platforms for machine operators to stand on

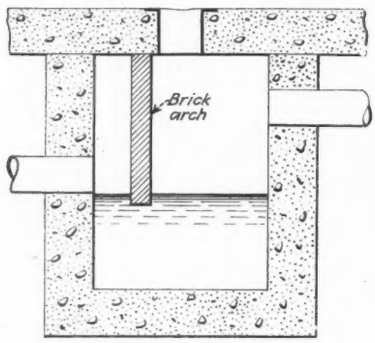


Fig. 11—Cross-section through sump basin showing the brick arch that serves as a separating baffle

where signs posted in every room give very light safe working loads. Too light floors are likely to prove a liability in case heavy loads or machinery are needed as time goes on, for in many instances it may be necessary to shore up underneath when a load that is only reasonably heavy has to be carried. Floors of loading and unloading docks and cold rooms where much wear is involved are of concrete reinforced with perforated steel plates.

Sewers That Don't Plug—Long experience in the dairy business has demonstrated the great desirability of sewers that can be kept open without a noticeable effort. In this plant the object of the design has been not only to attain that end but to construct them in such a fashion that they may be easily cleaned in case unavoidable stoppages should occur. Broken glass is the largest single item of foreign material that is found in the sewer lines, and next in order of importance are bottle caps and butter fat. The theory is not only to strain out all foreign solids by the baskets in the Josam traps but also to safeguard the drains by removing them into sump basins, such as Fig. 11, that are not over 50 ft. away from the Josam trap.

As an additional safeguard rodding basins, shown in Fig. 12, have been placed on all sewer lines so that any pipe may be rodded out without using more than 60 ft. of rod. Up to the present time there have been no stoppages for two years, but there is a great deal of satisfaction in knowing that any trouble which might occur can be easily corrected without digging up any lines.

Heating—Heating the plant in winter is done entirely with unit heaters except in the office. Exhaust steam is employed throughout. The entire roof of the plant is insulated with 2 in. of cork, which not only is an economical feature with relation to the heating problem in winter but affords a comfortable working place on the hottest summer days. Aside from these features the insulation serves a major purpose in the prevention of condensation on the ceilings, a too prevalent condition in a milk plant from the standpoint of appearance, and even more so from the standpoint of cleanliness. Very often the condensation beads are excellent incubators for bacterial growth that may be harmful to the very perishable product handled in these plants.

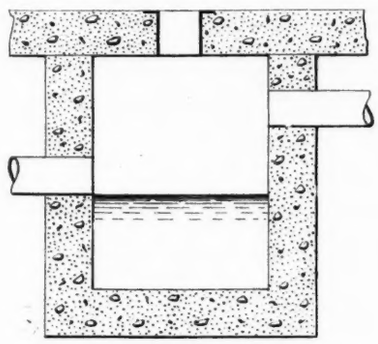


Fig. 12—Rodding basins such as that shown in this drawing are placed in sewer lines to permit rodding-out or cleaning the sewer lines when necessary

Unit heaters of the type shown in Fig. 13 are used in all floors above the basement. All wires in floor conduits are lead covered, which prevents short-circuits due to moisture.

Windows and Lighting—With the very large windows that are found throughout the plant, the problem of artificial lighting is a small matter, except for night work. It is probable that this plant, before it is again

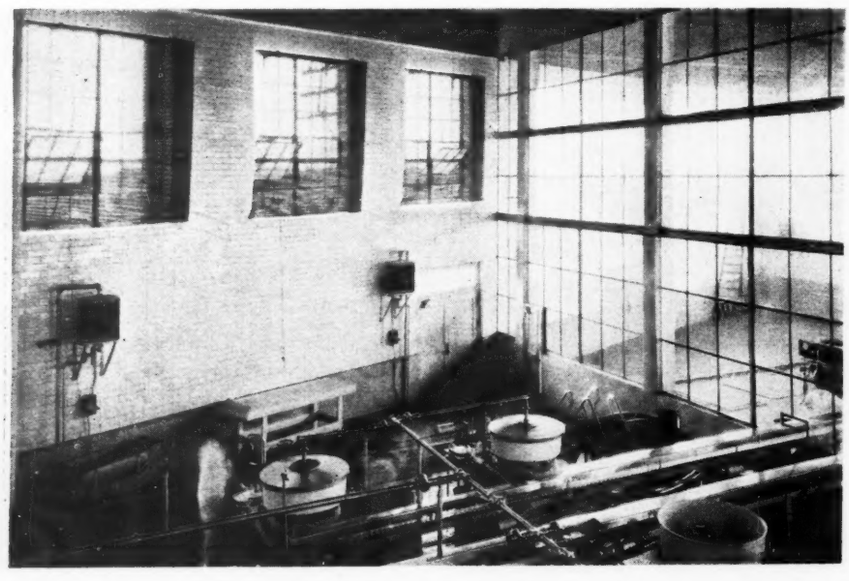


Fig. 13—View in the filling room, showing unit heaters of the type employed for heating this plant. Note the screens on the upper windows used to prevent direct sun rays from entering

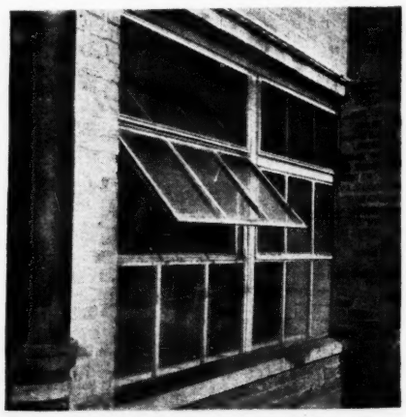


Fig. 14—All openings at the plant of the Wieland Dairy Company are screened as indicated by the window shown here

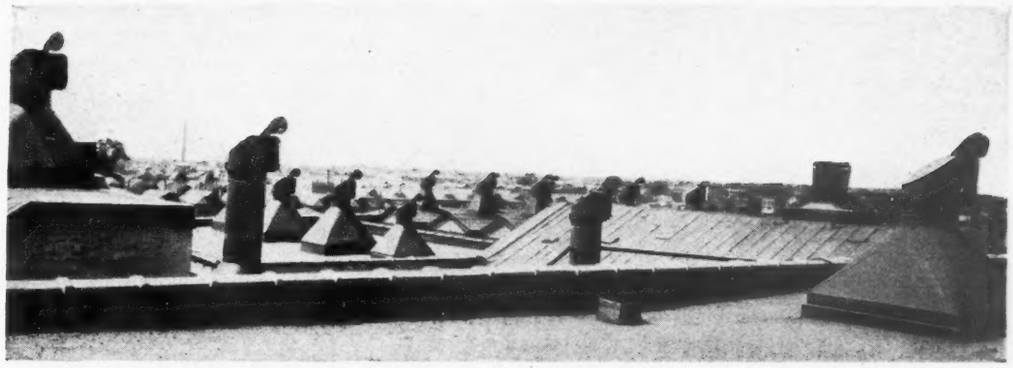


Fig. 15—These ventilators on the roof of the Wieland plant indicate one of the steps taken to remove vapor from the processing rooms

enlarged, will gradually increase its business until it is on an 18-hour shift, which will require considerable night work. Provision has been made for illumination in the future and the close observer will find many ceiling outlets that are now left blank where some day fixtures will be installed.

However desirable large windows may be, they are a source of annoyance to operators in the summer time when they happen to let in the direct rays of the sun. Wieland curtains many of the windows on its southwest sides by Ra-tox shades, as shown in Fig. 13, which permit diffused light to enter without allowing direct rays of the sun to make the room unbearable.

In discussing windows in a food plant the perennial problem of screening must not be overlooked. By referring to Fig. 14 the solution of the problem is shown. Very few flies can or do gain access to the plant.

An abundance of extra outlets for 110-volt lighting current is found. Hardly a place in the plant exists without sockets in which to plug in an extension light whose cable need not be over 20 ft. long. This is a feature that is most appreciated by repair and maintenance men, for there need be no delays to hunt for an extra long extension in moments of emergency.

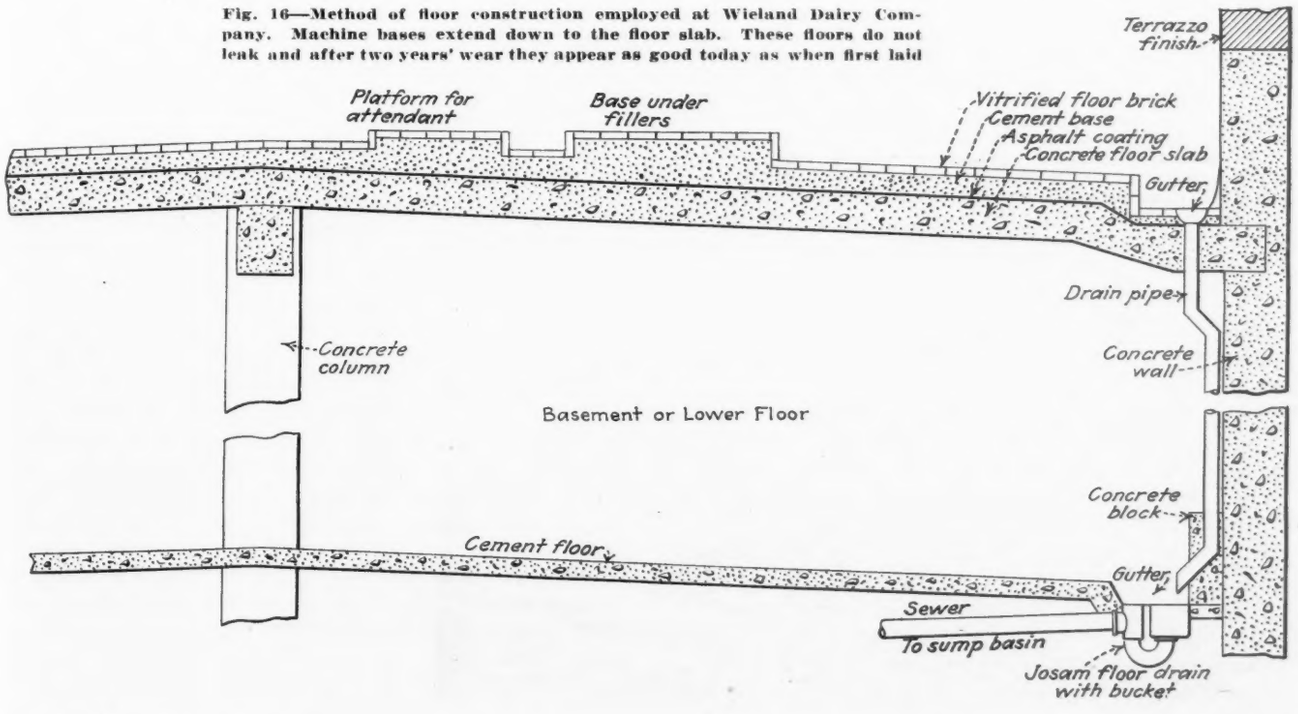
And, speaking of extra lighting sockets, the extra power outlets should not be overlooked. Wherever there is a possibility of a temporary need for 220-volt current there is always to be found handy a suitable 3-phase plug outlet.

Ventilation—In any plant where large quantities of water and steam are used the problem of ventilation means much more than merely supplying fresh air. It requires the removal of large quantities of water vapor as well. Good ventilation probably is more important in a dairy than in other food manufacturing plants, because of the possibility of contaminating the milk with drip. As has been explained elsewhere, the drip has been eliminated by the use of 2-in. cork insulation on the roof, but, of course, the insulation does not remove the moist air.

If moist air accumulates in very cold weather, the room will soon fill with mist or fog and the visibility be reduced to a point where there is a distinct hazard. In exceptionally bad cases one cannot see more than 5 or 10 ft.—a condition that is hardly conducive to efficiency.

Ventilating problems are greatest at this plant in the washer room, the filling room, and the cooling room. A forest of Swartout ventilators is shown on the roof in Fig. 15, each being in a location that has definite relation to the room below, which is to be ventilated. This is particularly true of the ventilation of the bottle

Fig. 16—Method of floor construction employed at Wieland Dairy Company. Machine bases extend down to the floor slab. These floors do not leak and after two years' wear they appear as good today as when first laid



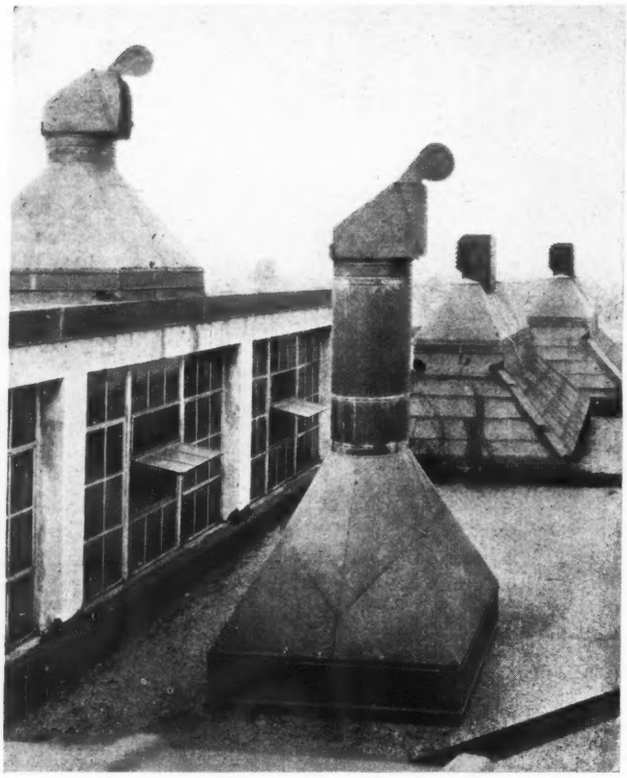
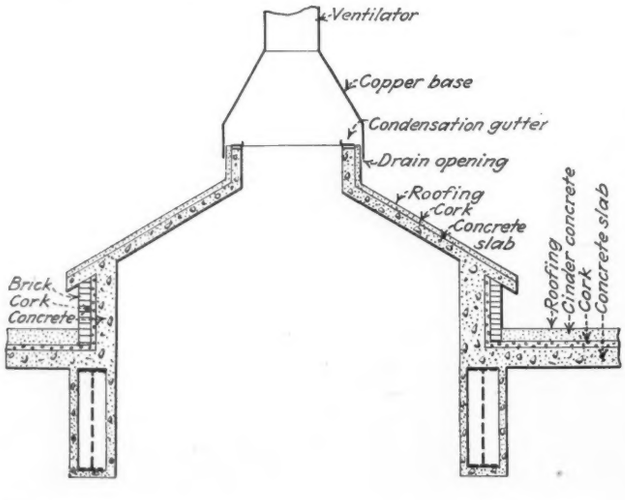


Fig. 17—Two exhausters at right rear remove all air in the cooler room every three minutes thereby preventing fogging of the windows. Note the staggering

washer room, a cross-section of which is shown in Fig. 18. The position of the ventilating pockets over the washers is very carefully arranged, so that the steam arising from them passes directly into the hood and thence through the ventilators.

Fresh outdoor air is supplied to the basement in both winter and summer through a large unit heater, in which, of course, no steam is used in summer. At the opposite side of the basement an exhaust fan draws the moist air out and blows it up to the roof. This cross-current of outside air makes comfortable working conditions as well as serving to keep down the humidity despite the amount of water used in the basement. A

Fig. 18—This drawing shows a section of the ventilating hoods of the bottle washer room with condensation gutters and drain openings. Horizontal surfaces are avoided to prevent air pockets



portion of the basement air undoubtedly finds its way upstairs into the washer room by leakage through the conveyor openings and aids in creating an upward draught in that room.

A further means of preventing fog is the use of unit heaters in the washer room with their vanes directed to blow warm air into the columns of vapor ascending over the washers. The isolation of the washers in a glass-inclosed room that is thoroughly ventilated is also a necessity in order to carry off the disagreeable odor of the caustic solutions in the bottle washers. All caustics have this same odor and, because it is easily absorbed by milk, it must be removed promptly. Health department regulations require this isolation for the same reason.

Ventilation of the filling room is less of a problem because no hot vapors arise during operations. Most of the vapor accumulates during washing or clean-up and hence a smaller column of air need be removed. Furthermore, the ventilating hoods in use over the washer room are unnecessary and permit the arrangement shown in Fig. 19.

Getting the water vapor out of a room such as the

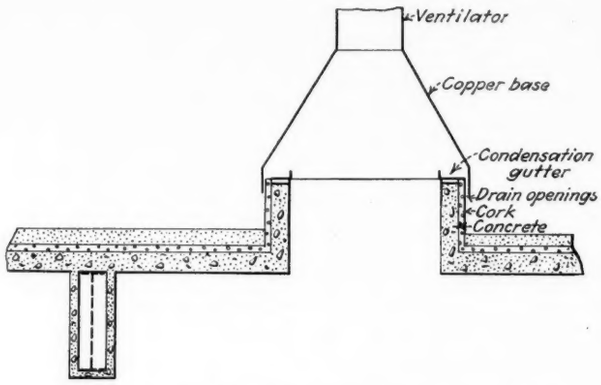


Fig. 19—Ventilating of the filling room is carried out by the method shown in this drawing

washer room involves more skill than the mere movement of a predetermined number of cubic feet of air, if condensation on the ceilings and its attendant drip is to be avoided. In fact, the movement of air is only half the battle. Insulation with cork only partly solves the problem, for, although it helps a great deal, the condensation is still present in winter weather, but to a lesser extent.

As worked out in this plant the principle of the inclined ceiling where the steam arises is found to be essential to prevent areas of stagnant air. Next it is very important to surmount the ventilating structure with a good hood or ventilator in order to create an upward draft of air. But by virtue of its metallic construction the ventilator itself may be a source of drip unless provision is made to take it away. Fig. 19 shows the manner of mounting the ventilator to avoid ventilator drip, but even that is not entirely sufficient, for in very cold weather the drip will freeze and eventually plug up the opening. Therefore, it is necessary to inspect the ventilator daily and remove the icicles by hand to maintain a free opening for passage of the water.

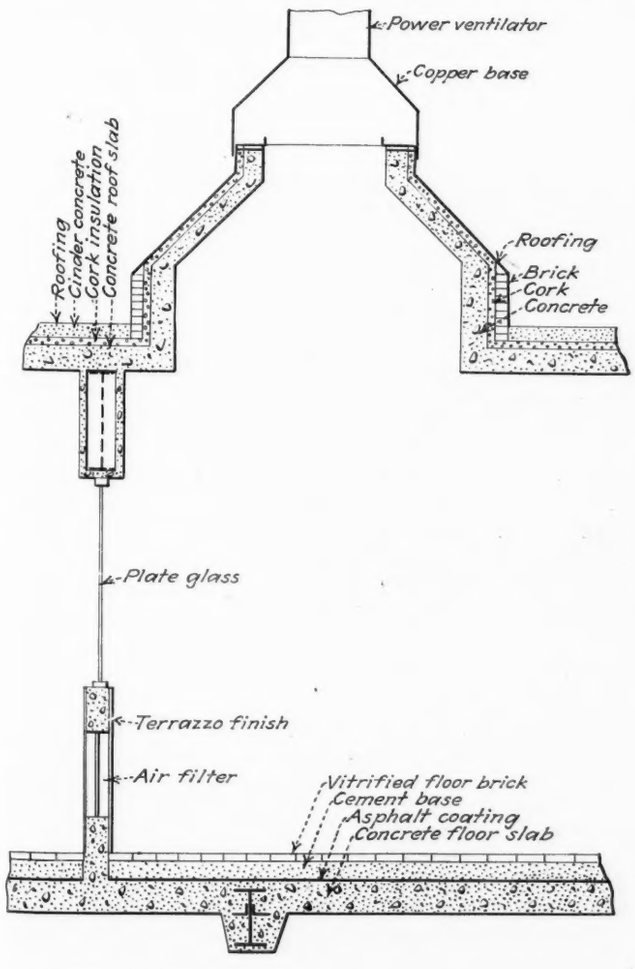
But even then there still remains a small amount of condensation on the interior surface of the ventilating hood. This forms very slowly, but seems to be unavoidable, even though every possible economically sound

precaution may be taken. A careful study of the problem led to the adoption of a scheme that has proved successful for two years. The interior of the ventilating hood is plastered with a very porous plaster, in which every effort has been made to prevent it from being waterproof. The theory underlying this method is an attempt to absorb what moisture may form and thus prevent its running down and dripping to floors or equipment below. Each night there is a period of inactivity in the plant which permits the porous plaster to dry out and prepare itself for the task of absorbing the small amount of moisture that forms on the next day.

Careful observation from the floor, which is 28 ft. below the hood, shows that there is a perceptible accumulation of moisture, but in the two winters that have elapsed since the reconstruction of the plant there has been no drip.

Probably the finest piece of ventilation work is found in the milk-cooler room, which is shown in Fig. 20. In this glass-inclosed room the constant rise of water vapor from the milk that streams over the cooling coils would soon fog all the windows to the point of invisibility. Fogging is obviated by the expedient of drawing a complete change of fresh air through the room every three minutes by means of the ventilating fans shown in Fig. 17, atop the hooded ceiling of the room. But this introduces another problem. The constant stream of air must not be allowed to bear dust to contaminate the pasteurized milk. The dust therefore is removed

Fig. 20—Sketch showing the method of mounting the ventilators to avoid drip



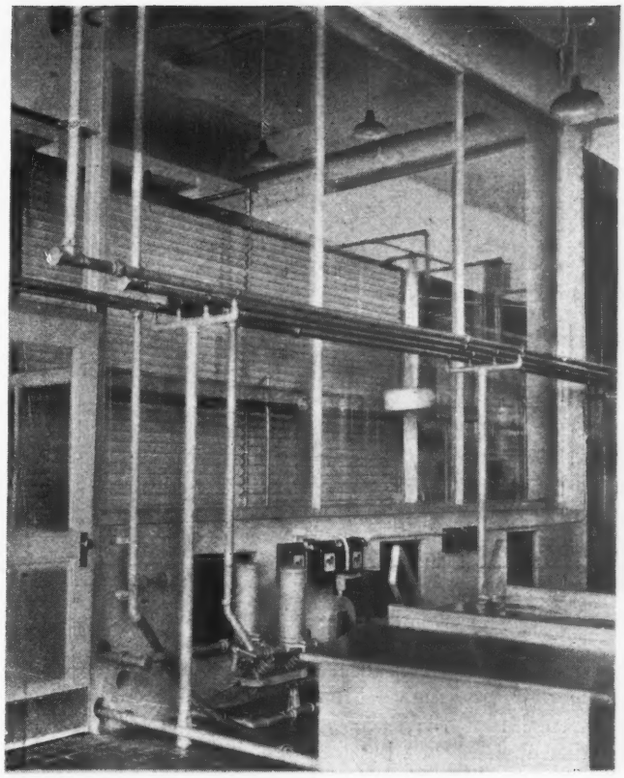


Fig. 21—The milk cooler room is surrounded with plate glass walls which have air filters in the wainscot. Note the hooded effect of the ceiling for ventilation

by Reed air filters (the black squares in the walls of Fig. 21).

Wall Finishes—No discussion of a dairy, or any food plant, is complete without mention of the finish of interior surfaces. In milk plants, in particular, it is fairly common practice to have tiled walls with painted ceilings. The latter are not perfectly satisfactory, however, for any painted surface must ultimately be repainted, and when paint is drying it gives off an odor —inoffensive though it may be to some, it is, nevertheless, distinctly out of place in rooms where it can find access to milk, for the milk will absorb it with surprising rapidity.

Wieland has avoided this problem entirely by using terrazzo wainscot with white-tiled walls from wainscot ceiling, and book-tile ceilings that are of smooth finished concrete plaster. Figs. 4 and 13 show typical interior wall finishes.

Provision for New Equipment—One of the commonest forms of new equipment to be purchased in a dairy are large glass-lined tanks, and unless the original plans for a plant have provided for such a contingency the problem of getting huge tanks into a building is a serious one that may involve knocking a large hole in the wall. At Wieland's this has been cared for by having extra large door openings located in those departments where large equipment is to come in or be moved out, for replacement of worn-out or obsolete equipment must not be hampered by lack of exits. Fig. 22 shows one of these openings into the pasteurizer room on the second floor, with a convenient projecting I-beam above.

Keeping Inevitable Muss Out of Sight—An excellent provision in this plant is the arrangement of the bottle washers for feeding the dirty bottles into the equipment via the basement route. It is not difficult to visualize

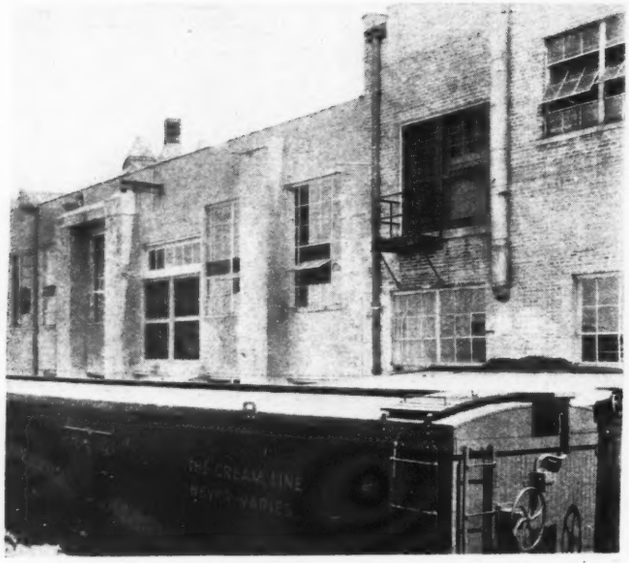


Fig. 22—Large openings in the wall of the building permit equipment to be brought in or removed

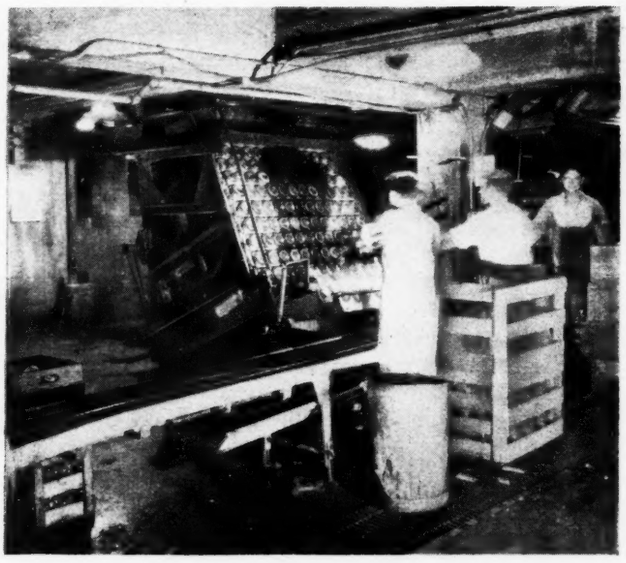


Fig. 23—Basement feed of the bottle washers in the Wieland Dairy Company plant in Chicago

the condition of dirty milk bottles when they are returned to the dairy. Anyone knows from his own personal experience that they are in all degrees of cleanliness and dirtiness. Some have been used for every purpose but the one for which they were intended. But all of them must eventually go through the bottle washers, and the place where they are fed to the machines can never be as cleanly or as orderly as a fastidious factory manager would desire. The trash that is returned with dirty bottles consists largely of paper, bottle caps, straws, and similar materials. It is particularly noticeable in the pint bottles, because this size is used a great deal by workers around industrial establishments as a part of their lunch. In the absence of washing facilities where the workers eat, the pints are returned in worse condition than quarts. In Fig. 23 the operators happen to be feeding quarts that have been returned in crates from the Chicago Bottle Exchange. Some of the inevitable trash can be seen.

When the Wieland plant was rebuilt in 1928-29 the new bottle washers were ordered with basement feed, so that the unavoidable disorder at the feeding station could be kept out of sight. The scheme of operation is shown in Fig. 23. By utilizing the principle of keeping the muss out of sight the washer room is the place of beauty shown in Fig. 24. It has the further advantage of keeping the space around the washers free from encumbrance with case conveyors and case washers.

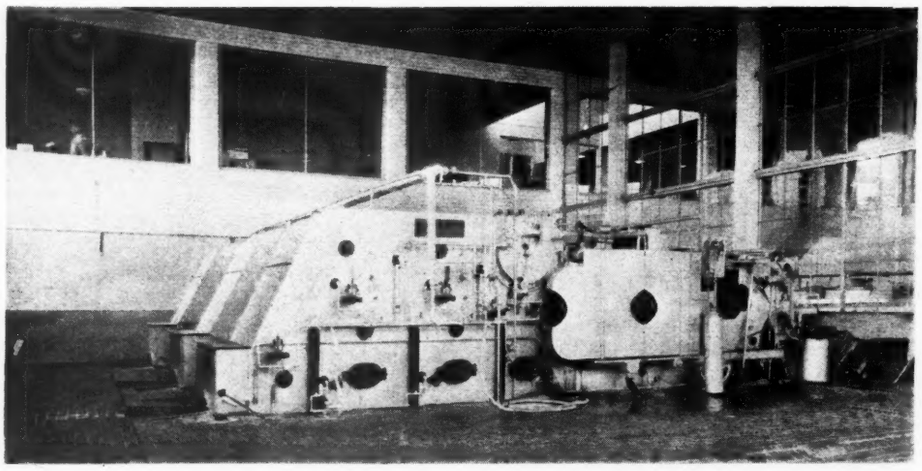


Fig. 24—Upper or discharge portion of the bottle washers, located on the floor above the basement

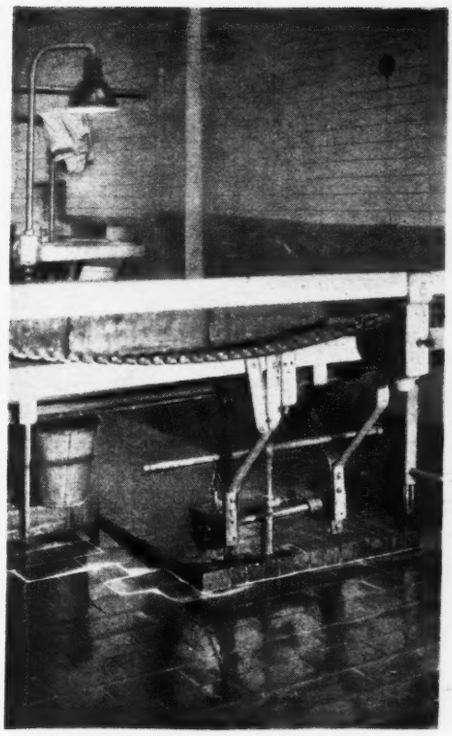


Fig. 1—One of the platforms built into the floor to give machine operators a raised, level standing space in departments where floors are wet and sloped for drainage

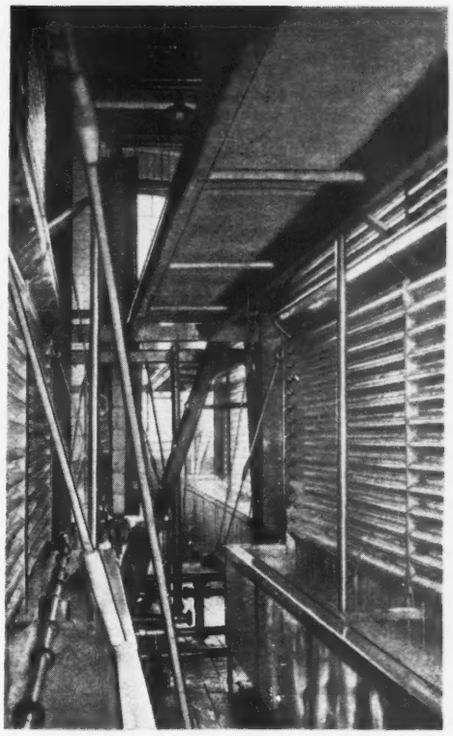


Fig. 2—The staggered arrangement of these milk coolers allows enough space to permit easy cleaning of the tubes with long-handled brushes after a day's run is completed

Equipping for Efficiency

By ARTHUR W. HUFF
Plant Superintendent, Wieland Dairy Company, Chicago

MOST of the ways in which to make a plant efficient consist of making the work as easy as possible for the employees in order to avoid fatigue. The most effective step to take is to eliminate all back-breaking jobs, such as lifting heavy milk cans. Using conveyors wherever possible and locating them at the proper height has eliminated all of the heavy jobs at the Wieland plant. The only lifting that is necessary is involved in loading or unloading the vans or insulated trailers in which bottled milk is transported to the branches.

Another feature of equipping this plant that has been very carefully studied is the placement of the filling machines with reference to the case conveyors. The distances, 15 in. and 18 in. between center of working places on machines and center of case conveyors, have been determined as most suitable for men of average size. The two figures differ only by the width of the bottle conveyor, for the machines are in tandem, with separate conveyors to each. Also we have made the brick platform, on which the operator stands, of the proper height to make the work easy, as shown in Fig. 1.

Placing the bottles in the cases is an operation where it is possible to avoid waste motion. In many plants which employ a roller conveyor at this point it is necessary for the operator to give the filled case a shove in order to get it out of the way in time to begin filling a second case. The Wieland plant, however, is equipped with conveyors throughout, and it is necessary only to have a device on the conveyor to stop and hold a case while it is being filled. While it is being thus held the conveyor chain continues to slide underneath. We have arranged the case stopper for treadle operation so that pressure from the foot of the operator releases the movement of the cases until the operator's foot is moved, as shown in Fig. 1 and in Fig. 5 on page 444.

Pipe lines for milk must be washed and sterilized every day, and the longer the lines the greater the amount of cleaning to be done. Therefore short lines are an advantage from the cleaning standpoint. They also have a further advantage of minimizing the amount of increase of temperature in the milk as it flows between the coolers and the filling machines, and hence in this way contribute to better keeping quality of the milk.

Proper arrangement of equipment facilitates cleaning. This is particularly true of the cooling equipment. By referring to the picture on page 450, it will be seen that the plant is equipped with banks of coolers apparently

placed end to end. However, by referring to Fig. 2, it is seen that they are staggered rather than in line. Such an arrangement makes it possible to insert long-handled brushes to scrub out the tubes in the daily cleanup. Without staggering, the cleaning would be very difficult, and only flexible-handled brushes could be used. Staggering the coolers has also necessitated staggering the ventilating hoods for the cooler room, as shown in the picture on page 456.

Straight-line production is understood, of course, to be an essential feature of a well-operated plant, but, even when the layout is so arranged that operations are continuous and progress is made toward the definite goal—the consumer—at every stage, something more is involved. That something is expressed in two words, "Keep Moving." All of the best-laid plans for efficiency fall down if the milk or containers fail to keep up with the demand. Large storage tanks are on hand to provide an adequate supply of milk and it is seldom necessary to shut down for that reason. An ample reserve of cases and bottles is always on hand, so that no delays ever are occasioned from that source.

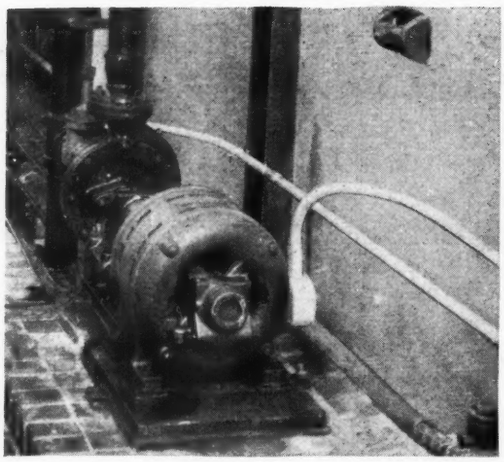


Fig. 3—Efficient operation of bottle washers is assured by booster pumps which serve to maintain correct pressure on the water in the washer regardless of conditions in the water mains

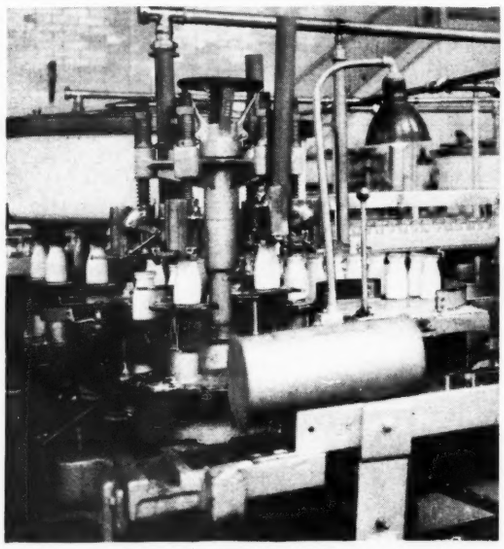


Fig. 4—In order that bottles may be held on the conveyors until needed, without stopping the conveyor motors, this can of liquid soap lubricates the metal plates on the conveyor so that they will slip easily beneath the bottles

Provision for an adequate supply of cases and bottles is much more important than it appears on paper, for when either item fails the operation of the whole plant comes to a standstill. The short shutdowns that we experience are usually only those that arise from changing batches of product. Thus a short delay occurs every time we change from regular milk to Guernsey milk, from Guernsey milk to cream, and from cream to chocolate milk, buttermilk, and cultured milk. Another source of minor delays, sometimes caused by plugging of sewers, has been eliminated in this plant by the use of suitable traps on all sewer lines. The traps, however, must be kept in order and cleaned out every day. We employ a man whose principal duty is to remove the baskets in the Josam traps and dump them with regularity, and by this means floods are avoided. Full details of the design and arrangement of drains and sewers is shown on pages 451 to 458.

Equipping for efficiency is not the whole story. Efficiency is maintained by operating efficiently—by keeping eternally at every detail—but with properly arranged equipment the work is made much easier.

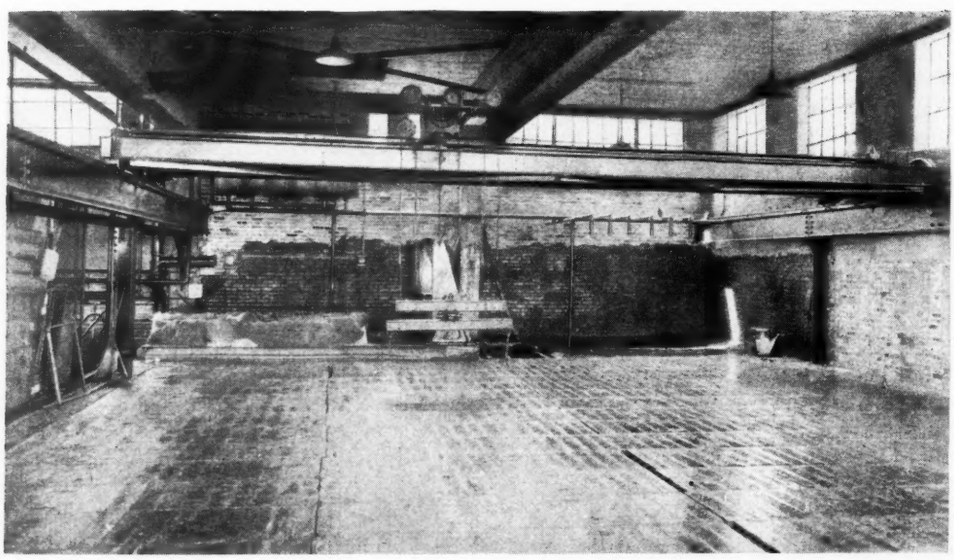
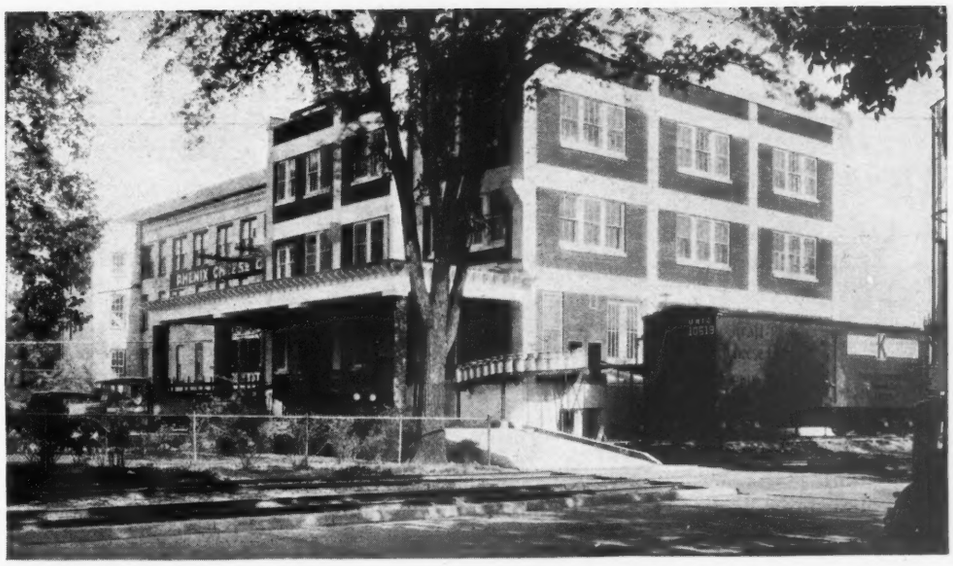


Fig. 5—The ice freezing room has a crane that lifts six tanks at once. Note the automatic tank filler and the feed chute for the chipper at the rear of the room



Plant of the Kraft-Phenix Cheese Company at Beaver Dam, Wis.

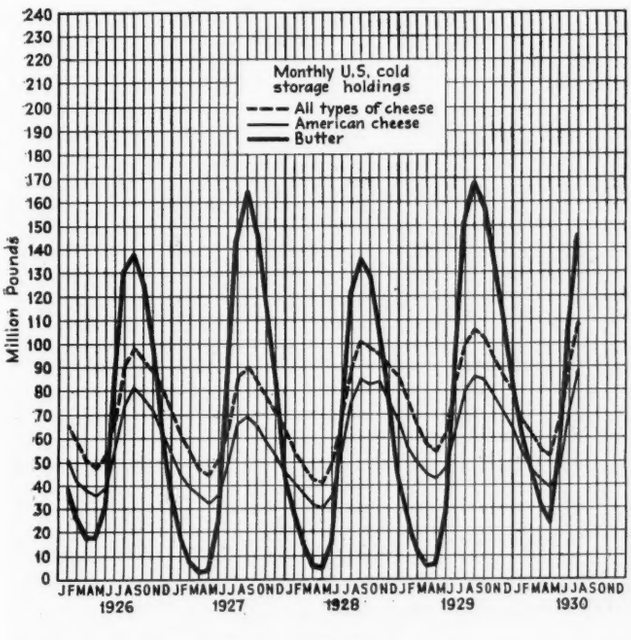
Why FLEXIBILITY *of Manufacture Is Necessary to Get Maximum Profit*

By ROSCOE A. PAGE

General Manager of Production for Central District, Kraft-Phenix Cheese Corporation, Chicago

NOTHING touches the life of an agricultural community more closely than the agencies through which the production of that community is marketed, and this is especially true in a dairying section where frequent and, in most cases, daily contacts with the producers are made. In this respect, the dairy plant becomes something in the nature of a public utility, serving the best interests of all the producers and providing an outlet for peak and seasonal production. So far as compatible with the established business of the plant, it should be able to turn the flow of milk and cream into the most profitable channels, yielding the best returns to the producer.

Fig. 1—These curves show the monthly holdings in cold storage, from 1926 to date, of butter, American cheese, and all types of cheese



Much advice has been given to farmers to diversify wisely. It is not out of place, perhaps, to suggest a greater flexibility in dairy manufacturing plants themselves. There exists a co-relationship between all dairy products, yet conditions affecting supply and demand covering a wide territory can seriously throw out of balance the normal price ratios. A glance at Fig. 1, which is a chart of monthly holdings and stocks, and at Fig. 4, which is the average price of butter and cheese for the last few years, reveals the variation that is constantly recurring in minor cycles.

The average price for butter for the past four and a half years has been 2.09 times the cheese price. The chart indicates that during the early part of 1927 and the latter part of 1928 and the early part of 1929 butter paid much better than cheese. In the latter half of 1927, the summer months of 1928, and the winter of 1929-30 cheese paid better than butter. This reversed itself in July and August of this year, and temporarily butter and cream have paid better than cheese. This

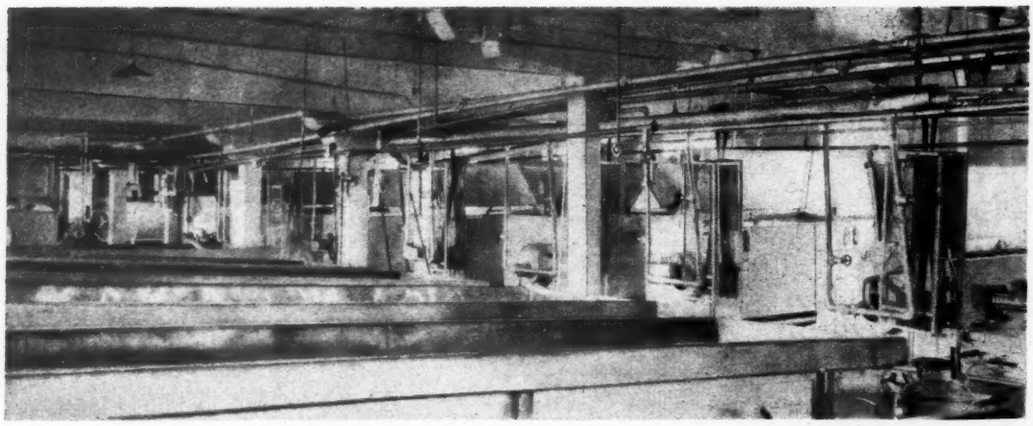


Fig. 2—Copper vats with tin linings in the cream cheese department, with a row of pasteurizers beyond

again indicates the desirability of being able to change production quickly and take advantage of the most profitable outlet.

In working out our program of diversification, we have endeavored to make our plants flexible and our producing operations quickly responsive to rapidly changing market conditions. This is well exemplified in our Beaver Dam (Wis.) plant, where the accompanying pictures were taken. At this plant the main items of production are fresh cream and package cheese of different varieties, all of a highly perishable nature and subject, therefore, to varying demand. This fact, together with a usual reserve of supply, furnishes an ideal demonstration of the value of dairy plant diversification.

Diversification of products and easy flexibility of manufacture are obtainable, however, only when a plant is properly equipped to carry out the various functions, and not only must the equipment be present but also the plant must be manned by trained personnel. Some of the products which we make require great skill in their manufacture—such as Camembert cheese—and if their quality is to be maintained constantly on a high level, the operations must be carried out every day. With other products the plant must be ready at all

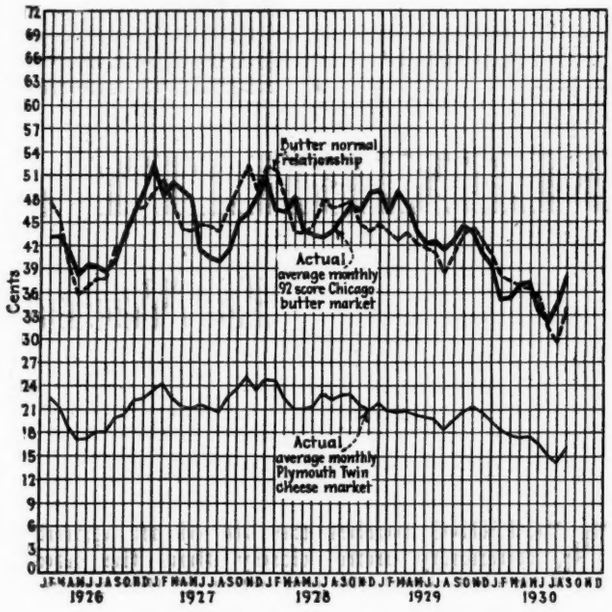
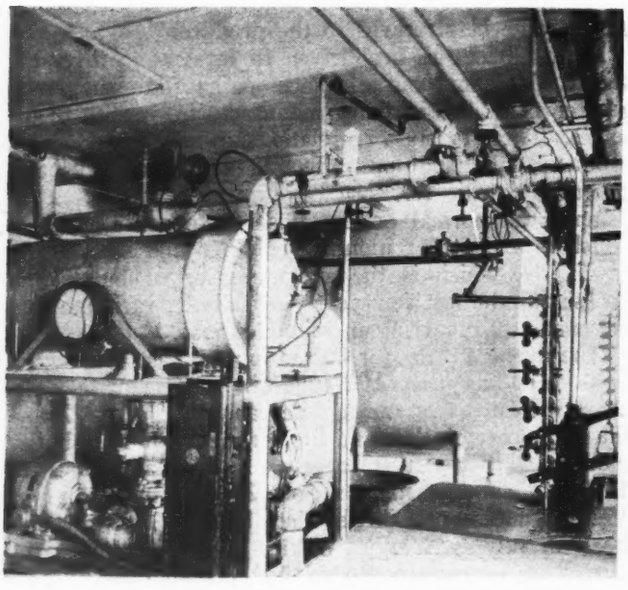


Fig. 4—Curves showing the price relationships between butter and cheese since 1926

Fig. 3—This heater maintains a constant temperature in the water used for pasteurizing and washing and is equipped with a pump and a bypass for maintaining a constant water pressure



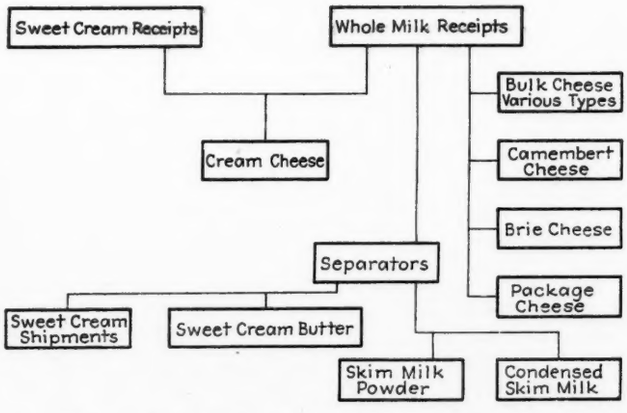


Fig. 5—Flow sheet of the manufacturing operations carried out in the Beaver Dam plant of the Kraft-Phenix Cheese Company

times to begin manufacture at a few hours' notice.

Successfully managing a plant of this kind usually requires that some of the products be made daily. Flexibility usually is obtained by increasing or decreasing the rate of production by using more or fewer units rather than by shutting down completely on a

Fig. 6—Milk cans are unloaded at Beaver Dam from the trucks directly onto a conveyor

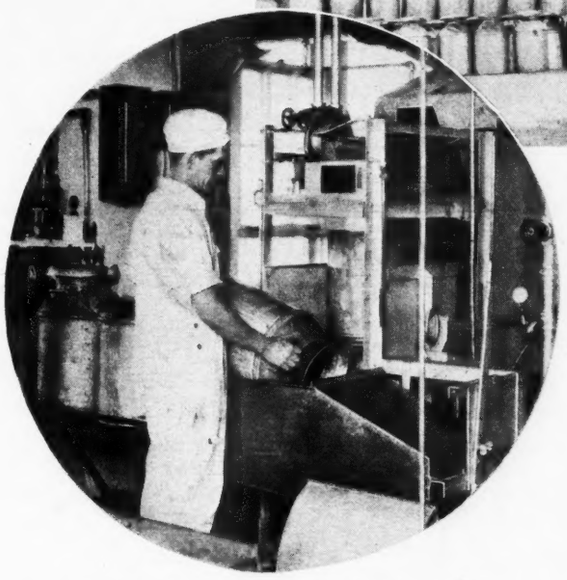


Fig. 7—As the milk cans pass into the plant they are weighed and then emptied

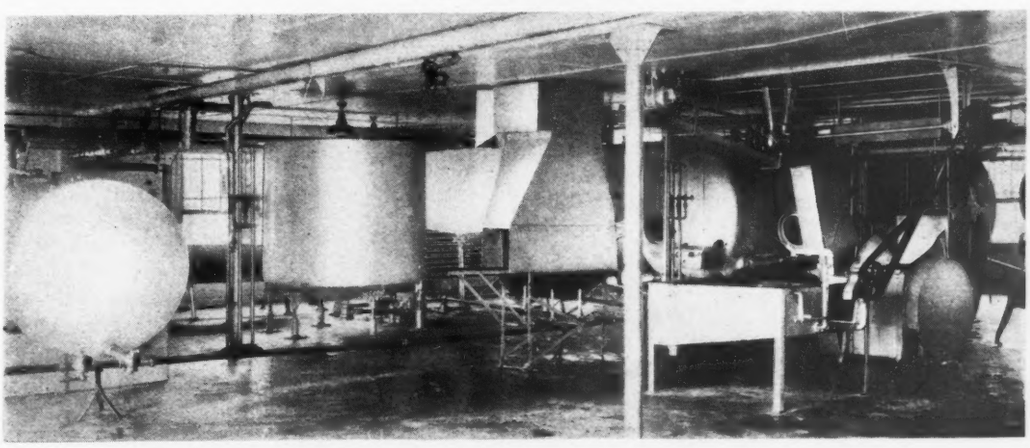
given product just because its margin of profit is temporarily lowered. There is seasonal production of certain bulk products, however, and, in event of a particularly unsatisfactory market condition, production of some products may be stopped entirely.

All of these plans for flexibility require the existence of ample manufacturing equipment and refrigerating capacity. They also require an outlet for all the perishable raw material that is received every day. In those periods when the contracted receipts exceed the demand, the milk must be used, and when all else fails to show a profit, the milk is separated to 40 per cent cream, which is then pasteurized and frozen in 5-gal. cans at about 15 deg. F., and the skim milk is evaporated to a dry powder; or, in rare instances, it is manufactured into casein. As a rule, however, this extreme is met only occasionally and then only in the flush period of spring or fall production.

Directing the operations of such a plant requires that each day the plant manager shall know what is expected of his organization on the following day. At the central sales office the daily orders are checked against the daily inventory of the plants, and the production department is informed of the needs of the immediate future or of the trend of prices. The next step is to telephone instructions to the branch plant on what to manufacture. Usually this is done at about 10 a.m., and it frequently happens that manufacturing operations can be shifted on the same day instead of waiting until the next day.

The accompanying flow sheet indicates the possible channels into which production can move quickly and without confusion. The initial steps in the procurement program are the same for all products, including the matter of quality grading and inspection of raw material, and its receipt and storage. Raw milk received either direct from the farmers, as shown in Fig. 6, or by tank car or in 10-gal. cans by rail on the siding shown in the head, enters the plant and is inspected, weighed, and sampled for laboratory analysis. Fig. 7 shows the operation of emptying the cans and starting them through the can washer. In order to utilize the gravity flow system the milk and cream is next pumped to holding tanks on the top floor, shown in Fig. 8, from which the cream or whole milk flows by gravity through the successive steps of manufacturing or until it is

Fig. 8—General view of equipment installed on the top floor of the Beaver Dam plant



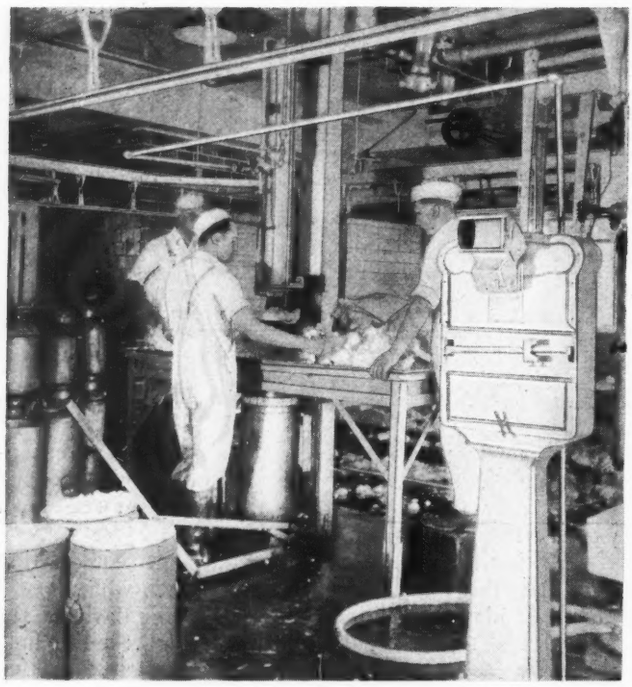


Fig. 9—Compressed-air operated ram filling cans with cream cheese, a method assuring uniform packing without voids

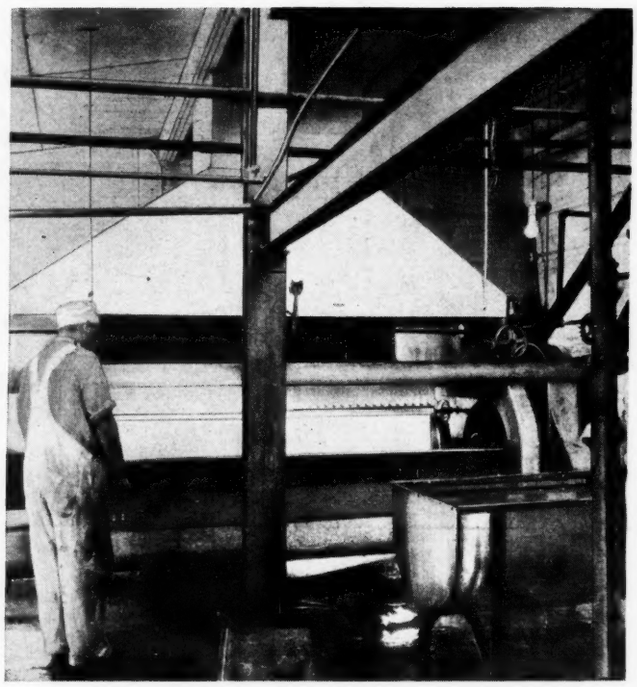


Fig. 10—When other possibilities are exhausted, dried milk is made from surplus skim milk after condensing it in a vacuum pan

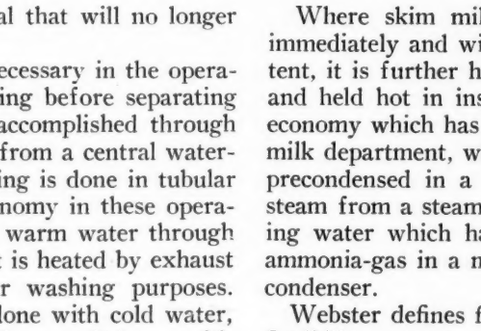
converted into a semi-solid material that will no longer flow in pipes.

Several heating operations are necessary in the operation of this plant, such as preheating before separating or pasteurizing, all of which are accomplished through the medium of hot water obtained from a central water-heating unit shown in Fig. 3. Cooling is done in tubular coolers and in coil vats. Heat economy in these operations is effected by circulating this warm water through a closed-type water heater, where it is heated by exhaust steam, after which it is used for washing purposes. Only the first stage of cooling is done with cold water, the completion of the operation being carried out with refrigerated brine.

Where skim milk is to be condensed or powdered immediately and within practical limits of bacterial content, it is further heated as it comes from the separator and held hot in insulated storage tanks. Another heat economy which has been found practical is in the dried-milk department, where the milk to be powdered is first precondensed in a vacuum pan which utilizes exhaust steam from a steam-driven ammonia compressor. Cooling water which has already been used in cooling the ammonia-gas in a multiple condenser is used in the pan condenser.

Webster defines flexible as being manageable. Proper flexibility means easy manageableness which makes profitable a diversified operation.

Fig. 11—The large window openings on each floor permit easy delivery or removal of equipment, as in the case of this milk storage tank



FLUID MILK DISTRIBUTION*

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By HARRY A. CRONK
President, Borden's Farm Products Company, Inc., New York

An Interview by O. Fred Rost

DIDACTICAL indeed must have been the mood of Mother Nature when she vested in her most perfect and, to man, most desirable food, milk, the inherent faculty of spoiling upon exposure to air; of losing its sweetness, its identity; turning into something entirely different; thus immediately imposing upon mankind the task of paying with the labor of brain and brawn for the privilege of enjoying it elsewhere than at its source.

And man, by destiny inducted into the milk-consuming class at birth, has literally traced his progress in civilization, in science, through the record of how he has gradually circumvented nature's jealous desire to spoil her most precious gift.

The dairy industry has never had production problems of the type that confronted practically every other line of industry; could never improve its products by ordinarily accepted methods; could not increase its output by merely buying more machines; could not increase its crop by a simple increase in acreage; or fight a pest by spraying budding plants or ripening fruit. It could only hope to guide, protect, perhaps stimulate, the actual process of production, but beyond that it has accepted nature's unspoken challenge and gradually perfected methods of distribution that almost bend the will of nature to the desire of man; that make possible the delivery at the doorstep of the tenement, or the palatial home, at a nominal cost, of pure sweet milk, or its multiplicity of byproducts, even though the source may be hundreds of miles distant.

From early pioneering days of the industry right through to this day the name Borden has been so intimately and inseparably linked with the distribution of milk, represents today so authoritatively all that stands for perfection of product, soundness of practice, economy and success of operation, that a record of the process and system under which Borden fluid milk and other dairy products are distributed to the consumer substantially constitutes a textbook on the subject.

"There is indeed a dramatic contrast," said President Harry A. Cronk, "between the methods we employ today in getting our various products to the consumer and those used back in 1856 by Gail Borden, the founder of this business.

"For instance, in pre-Civil War days, for the benefit of city dwellers, milk was put into large cans, loaded on two-wheel carts and pushed about the streets by the peddlers who rang a bell to summon the housewives, who would then bring their own receptacles to carry home whatever quantity they wanted. Ocean-going vessels either had to carry cows or goats, as a source of milk, or do without. Only the most primitive means for keeping milk cool were used, as no practical method of preservation or refrigeration had been devised.

"Gail Borden, founder of this enterprise, was deeply interested in this matter of milk preservation and distribution. He approached the problem from the only practical angle, reasoning that where nature had intended that milk should pass from producer to consumer without being exposed to the air, any process of milk preservation could be successful only to the extent that it respected nature's original decree. Hence, after many experiments he invented a process of evaporating milk in vacuum, obtained a patent in 1856, and in a small plant in Walcottville, Conn., laid the foundation for the business that today represents an investment of many million dollars, and of which the fluid milk division forms an important part.

"It was about 1885," continued Mr. Cronk, "that the company first undertook the supplying of country bottled milk to the people of New York City, Borden being among the first to provide the added health safeguard in delivering milk in sealed bottles. Long before that year the company operated delivery wagons in New York City, but only condensed milk was handled in the earlier

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Electric-type of retail milk delivery trucks lined up at the loading platform of a local distributing station

days. The years that came and passed marked a gradual but steady expanding of the company's delivery facilities, including the building of additional city delivery depots, providing for hundreds more delivery wagons, and securing the employment of more men to serve these added routes.

"Thus the route department of the business, which, according to the company's library, was originally started in 1861 with seven wagons handling only condensed milk from the branch then located at 173 Canal Street, New York City, after including fresh bottled milk grew until today over 3,000 delivery wagons are being operated and 9,133 men employed in serving over 750,000 customers in the metropolitan area.

"And not only does the modern milk-delivery vehicle carry milk and cream but it also delivers fresh dairy products, such as buttermilk, butter, eggs, and cottage cheese; and such dairy and laboratory specialties as acidophilus milk, lactic milk, modified milk, protein milk, certified milk, soft curd milk, etc.

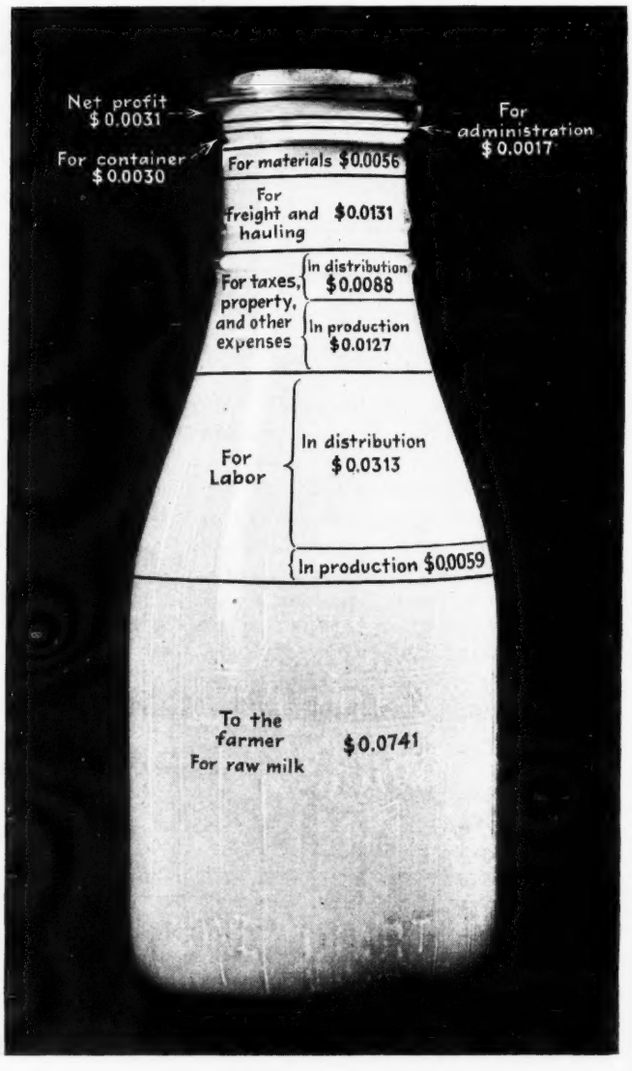
"Including the different size containers for light and heavy cream, and the different grades of milk and other products, the route salesman distributes from his wagon 41 items of dairy products to about 250 customers on each route.

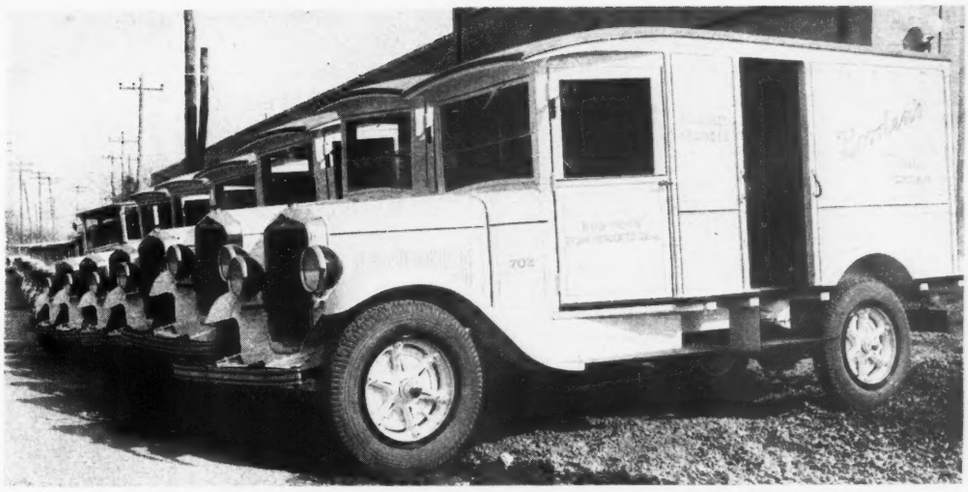
"The man who delivers milk today must be a salesman; he must be physically fit, free from physical disability or disease. He must be a bookkeeper and must know how to handle properly large sums of cash. He must be a careful operator of his motor vehicle. Our demanding all of these essential requisites has resulted in the necessity for training the new employee in a school of instruction, which the company maintains throughout the year, where hundreds of applicants are instructed in requirements necessary to success in the position of route salesman.

"The average route leaves the depot shortly after midnight and completes deliveries between 6 and 7 o'clock in the morning. The customers' requirements are carefully recorded in a route book, so that not only the regular route salesman will make accurate deliveries, but to permit his substitute to serve his trade properly, as the route salesman works six days a week, and a substitute, known as a junior foreman, serves the route on the seventh day.

"The bulk of our retail deliveries are made on standing delivery orders from the consumer. However, the route salesman must watch for changes in orders, which reach him through telephone messages to the delivery depot, or through notes left in bottles. To serve his 250 customers before breakfast the route salesman must know his territory thoroughly, so that not a moment is lost, as a fraction of a minute overspent on each stop will mean that he will get to the end of his route too late to give satisfactory service. He must be quick, sure-footed, alert, and withal, quiet in his operations.

The customer in the New York area pays an average of $0.1593 per quart. Divisions on the bottle indicate where this goes





Gasoline-engine truck for retail milk delivery. This is a type of vehicle widely used

What Makes the Retail Price of Milk

RAW MILK VALUE:		
Average payment per quart to dairymen delivering at Borden country plants		$0.0741
PRODUCTION EXPENSE:		
Labor—includes all salaries and wages for production plant direct operation	$0.0059	
Materials—include bottle caps, coal, ice, and all other supplies, except milk	.0025	
Property Expenses—are rent, taxes, depreciation of buildings and equipment, insurance and general milk supply department overhead expense	.0024	
Miscellaneous Expense — includes freight and hauling of milk between production plants, including cost of hauling from railroad platforms to city pasteurizing plants, handling expenses included in price charged for platform purchases, wasted products, light, heat and power, water, repairs to buildings and equipment, laboratory examinations and miscellaneous production plant expense	.0103	.0211
CONTAINERS:		
Cost of containers lost and destroyed, plus box and can repair expense, less credit for broken glass sold		.0030
FREIGHT AND HAULING:		
Average freight paid from country to city, plus cost of hauling from railroad or pasteurizing plant to delivery branches		.0131
SELLING EXPENSE:		
Wages and Commissions—include all wages and commissions paid delivery branch employees	$0.0313	
Materials—include hay, grain, and bedding, ice used in delivery, gasoline, and oil, garage supplies, automobile parts, and all other supplies	.0031	
Property Expense—is rent, taxes, depreciation on buildings and equipment, insurance and sales department overhead expense	.0048	
Miscellaneous Expense — includes light, heat and power, water, horseshoeing, repairs to buildings and equipment, stationery, wasted products, provision for bad debts and other delivery branch expense	.0040	.0432
GENERAL AND ADMINISTRATIVE:		
Total expense of administrative departments—executive, treasurer, accounting, statistical, purchasing, legal, stationery, personnel, real estate, insurance and general		.0017
NET PROFIT		.0031
TOTAL		$0.1593

"In many of our distributing branches motorization of delivery equipment is in full swing since suitable route delivery cars have become available, and where new branches are established the entire layout is made on the basis of 100 per cent motorization, as for instance at Rockville Center, L. I. That plant, designed to handle nearly 200 retail routes, receive all of the products by motor truck. Staples such as butter, eggs, cheese, and the like, are stored in huge refrigerator rooms from which the route salesman draws his supply, while fluid bottled milk is loaded from the bulk delivery trucks directly into the salesman's car.

"These latter are of the most improved type, expressly developed for the work, have special carrying racks, and can be operated from the running board on either side with utmost safety. A route salesman always uses the same car on his route. Each vehicle is thoroughly washed both inside and out upon completion of each day's run. The mechanical working parts, oil, and tires are carefully gone over by an expert mechanic, so that very little trouble is experienced on the road.

"Knowing his approximate requirements for the next day, the route salesman places his requisition with the stock clerk, and when he arrives the next morning his supply is assembled and he can start on his round of deliveries without delay.

"Because of the fact that customers are most inclined to be unreasonable when anything goes wrong with their breakfast, we take every precaution to prevent mistakes or failure to deliver. Through constant improvements of method and system we now maintain a uniform efficiency record of over 99 per cent."

In view of the great lack of public knowledge and understanding of all the incidental and supplementary functions that are necessary in the processing and preparation for the market of such a highly perishable raw product, Mr. Cronk was asked to outline briefly some of the precautionary requirements that Borden's imposes upon the suppliers of milk.

"It is obvious," continued Mr. Cronk, "that the rapid growth of the business developed rather early the need for definite standards and, because these were promptly established and improved upon as necessity demanded, we feel today that the 50,000 farms with their 600,000 cows, from which we receive our entire output of milk, supply a raw product of the highest obtainable quality, which is handled throughout with the utmost care and under extremely strict requirements of sanitation.

"Of course, some of the production, transportation,

and distribution methods that are today recognized as indispensable and ideal were in the early days looked upon with ridicule and denounced as far-fetched and extreme. However, almost at the very outset, Gail Borden realized that unless milk was clean to start with, other safeguards would be unavailing, and thus determined to safeguard the supply at the source.

"Therefore, in the year 1876, John G. Borden, who was then associated with Gail Borden, started to organize a definite form of dairy control. The fruits of this attempt soon matured, and as early as 1879 the Borden regulations governing cleanliness at the dairy farm showed undeniable results in cleaner milk. Encouraged in this, the company, in 1881, appointed its first inspector, to insure compliance with rigid but practical rules and regulations in the company's contract with its dairymen. Today we employ hundreds of dairy inspectors who work in conjunction with a staff of veterinarians, first formed in 1894, when Dr. Claude Morris became associated with the company.

"Furthermore, for many years research work has been carried on rigorously in the company's laboratories and, with ever-present vigilance on our part and the co-operation of the dairymen, the supply has been brought to its present high state of cleanliness and purity.

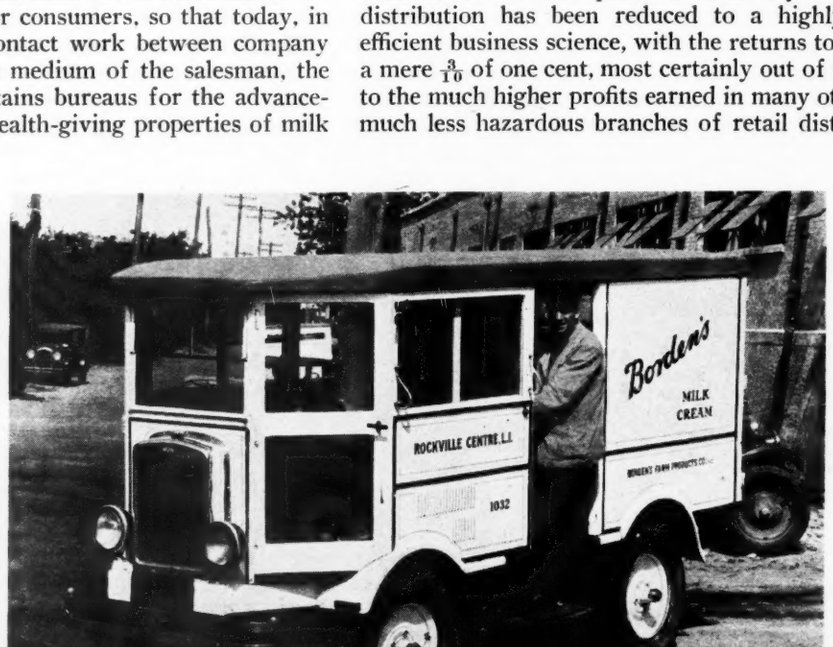
"That such high standards are maintained continuously is chiefly due to the fact that every procedure and function is carried on under carefully prescribed rules, rigidly enforced. These directions cover every operation on the farm and from the farmer right through to the delivery of the bottle of milk on the doorstep of the consumer. For instance, farms, herds, and equipment are inspected frequently by experts; temperature of milk is checked regularly; samples of the milk output of each farm are sent each day to our laboratories for analysis; before shipment to the bottling plant milk is cooled down to 40 deg. F.; a minimum content of 3.6 per cent butter fat is required for acceptance of milk.

"It is only natural that with the rapid growth of the business came the increased need for a more active interest in the welfare of our consumers, so that today, in addition to the personal contact work between company and customer, through the medium of the salesman, the Borden organization maintains bureaus for the advancement of education on the health-giving properties of milk consumption, in the public schools, before parent-teachers organizations, and other civic institutions. Diet, advisory, nutrition, lecture, medical, and other bureaus are maintained. A bureau of research is constantly devising ways and means for improving the product, the package, and service. Another bureau is constantly working to create literature which will teach the health-giving properties of milk and other of our products.

"Added to these modern aids in the distribution of milk are such departments as the personnel division, which looks after the welfare of the employees, guides the operation of an employee representation plan, and administers a mutual benefit association; the training school with its course of instruction on various phases of the business; a medical service to make a periodic checkup on the health and freedom from disease of all employees connected with the distribution and handling of milk; and departments looking after accounting, purchasing, construction, transportation, veterinary, treasury, production, motor vehicle maintenance, administration, real estate, and sales."

There has been much speculation as to just why milk, which not so many years ago could be bought for a few cents a quart, today costs the consumer 15, 16 or 18 cents. Mr. Cronk readily consented to the request that a break-down of the cost of a bottle of milk, f.o.b. doorstep New York City, be prepared.

During 1929, the Borden company received an average price of $0.1593 for each bottle of Grade "B" milk, which latter represents 75 per cent of the company's total volume on fluid milk. The analysis in the accompanying table shows the complete breakdown of the component items, starting with the price to the farmer and itemizing each unit of expense through to the doorstep of the consumer. These figures are based on the entire volume of Grade "B" bottled quart business for the year 1929 and are an integral part of the company's records, audited and certified to by Haskin & Sells, certified public accountants. The details given in this very complete breakdown seem to prove conclusively that fluid milk distribution has been reduced to a highly specialized, efficient business science, with the returns to the operator, a mere $\frac{3}{10}$ of one cent, most certainly out of all proportion to the much higher profits earned in many other assuredly much less hazardous branches of retail distribution.



One of the latest developments in retail milk delivery is a truck that can be controlled by an operator standing on the step

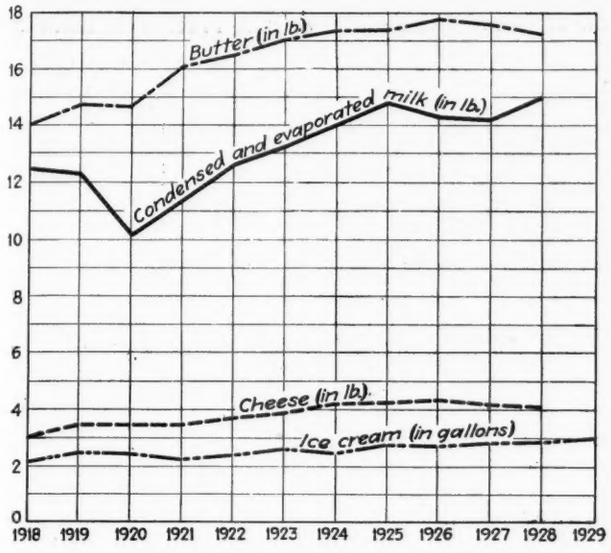


Fig. 1—Per capita consumption of dairy products

Trends in Consumption of DAIRY and POULTRY PRODUCTS

By E. G. MONTGOMERY
Chief, Foodstuffs Division,
U. S. Department of Commerce

ALTHOUGH a substantial and steady increase in the consumption of dairy products has been made in recent years, incomplete statistics leave a great deal of guesswork in any attempt to make quantitative estimates of these changes over a long period. Until the past decade our principal source of information was the decennial census; and even at the present time the information on which calculations of per capita consumption can be made is somewhat uncertain. Current figures are much better than earlier ones, as there is a constantly higher percentage of the total production accounted for in the reports made to the government. As a result, certain more recent trends are rather definitely established.

An approximate estimate of the consumption of milk products for the year 1899, derived from production figures of that year by adding imports and subtracting exports, indicates consumption of about 826 lb. of milk per capita. The same method of calculation for 1909 indicates 712 lb. per capita but it hardly seems reasonable, based on our general knowledge of conditions during the period, that the decrease was so great as this.

There probably was some decrease in consumption during the first ten years of this century, but it is probable that a good part of the difference is due to error in the earlier figures. Dr. O. E. Baker, of the Bureau of Agricultural Economics, who has made similar calculations of five-year averages, reports 875 lb. as the average per capita consumption of milk from 1897 to 1901, inclusive, and for the period ten years later an average consumption of 830 lb. It is probable that the decline, indicated in these estimates, more nearly approximates the facts than do the figures based solely on census returns.

Figures collected since 1919 are much more complete. They indicate a steady increase in per capita consumption of almost all varieties of milk products (see Fig. 1). While admittedly not complete, the data averaged for the three years 1924 to 1926 (the last years for which we have complete official reports) show about 1,025 lb. per capita of milk consumption. This, compared with the estimated consumption of 875 lb. 30 years ago.

In what form has this increased consumption taken place? The answer to this question is indicated in the tables and charts which accompany this article. Butter consumption apparently has not increased significantly. It may, indeed, have decreased slightly—perhaps about 2 lb. per capita—during the past 30 years. There has been a small increase in cheese consumption, a marked increase in the consumption of condensed and evaporated milk, and a still more rapid increase in the consumption of ice cream. Especially in recent years, the increase in the use of fluid milk has been marked. The consumption of fluid milk for the year 1919 is estimated by the U. S. Department of Agriculture at 43 gal. per capita and in 1926 at 55 gal. per capita, an increase of approximately 30 per cent in less than ten years.

It is well known that medical, public health, and child welfare agencies of all types have argued vigorously during the period under discussion for the generous use

Fig. 2—A steady increase is shown in the production of dairy products

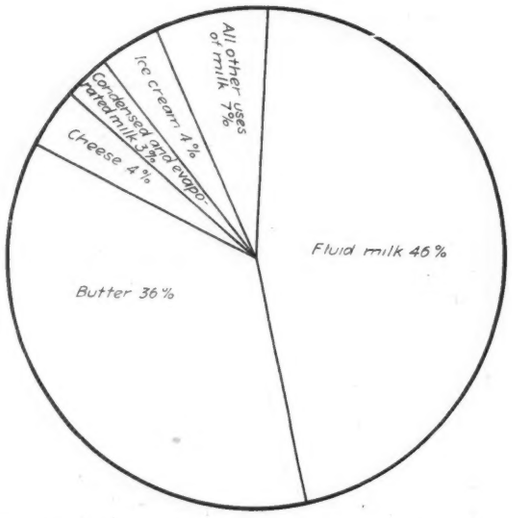


Fig. 3—How consumption of milk products is divided

of milk and milk products. It seems that almost every commercial agency, as well as scientific influence, has favored this increase. It is not surprising, therefore, that milk has taken on a constantly increasing importance in the general diet make-up. Commercial manufacture on a large scale of milk products has contributed.

In connection with these considerations of milk products it is of interest to notice the relative importance which each has in the total national diet. If one converts the various dairy products to a common basis of fresh-milk equivalent, we find the interesting results shown in Fig. 3 and Table III. These are based on the official reports of milk products manufacture and consumption during 1926, the last year available.

Table I—Apparent Per Capita Consumption of Dairy Products[1]

Year	Fluid Milk, Gal.	Butter, Lb.	Cheese, Lb.	Condensed and Evaporated Milk, Lb.	Ice Cream, Gal.	Dairy Products in Terms of Whole Milk, Lb.
1849	.....	13.9	4.0	.....	....	.....
1859	.....	15.1	3.2	.....	....	.....
1869	.....	13.7	3.3	.....	....	.....
1879	.....	15.8	2.1	.....	....	.....
1889	.....	19.5	2.9	.....	....	.....
1899	.....	19.9	3.7	.....	....	.....
1909	.....	18.0	3.85 (*a*)	.....	1.04 (*b*)	.....
1914	.....	17.0	4.60 (*a*)	.....	1.68	.....
1916	.....	15.4	3.04	.....	2.08	.....
1917	42.4	14.6	2.89	10.49	2.07	.....
1918	43.0	14.0	3.00	12.50	2.14	.....
1919	43.0	14.8	3.50	12.30	2.49	831
1920	43.0	14.7	3.50	10.17	2.46	841
1921	49.0	16.1	3.50	11.40	2.28	923
1922	50.0	16.5	3.70	12.69	2.43	950
1923	53.0	17.0	3.90	13.25	2.68	998
1924	54.75	17.38	4.20	14.00	2.50	1,020
1925	54.75	17.39	4.26	14.87	2.80	1,012
1926	55.30	17.82	4.36	14.32	2.77	1,040
1927	.....	17.61	4.14	14.23	2.85	.....
1928	.....	17.33	4.12	15.02	2.90	.....

[1] From Handbook of Dairy Statistics, by T. R. Pirtle, Bureau of Agricultural Economics, U. S. Department of Agriculture.
(*a*) Includes cottage cheese, which is not included for other years.
(*b*) For the year 1910.

Table II—Production of Dairy Products[1]

	Creamery Butter, 1,000 Lb.	Cheese (All Kinds), 1,000 Lb.	Sweetened Condensed Milk, 1,000 Lb.	Evaporated Milk, 1,000 Lb.	Powdered Milk, 1,000 Lb.	Ice Cream,* 1,000 Gal.
1921	1,054,938	383,154	292,221	1,171,942	42,788	147,949
1922	1,153,515	402,369	340,712	1,090,637	46,216	161,609
1923	1,252,214	430,224	345,902	1,428,979	68,811	173,412
1924	1,356,080	468,287	333,335	1,367,213	77,106	181,564
1925	1,361,526	502,999	348,898	1,408,960	82,248	214,382
1926	1,451,766	495,393	359,452	1,374,052	102,486	215,248
1927	1,496,495	482,365	346,368	1,509,354	129,587	226,756
1928	1,487,049	525,044	333,826	1,584,601	157,601	232,185
1929	1,595,078	.....	401,718	1,795,602	220,781	254,423

[1] Compiled from factory reports to the Bureau of Agricultural Economics, U. S. Department of Agriculture.
*Figures for industrial production only; Bureau estimates for total production of ice cream, including retail shops and homes, was 348,046,000 gal. in 1928 and 365,448,000 gal. in 1929.

Table III—How Consumption of Milk Products Is Divided[1]

Product		Approximate Milk Equivalent	Per Cent of All Milk So Used
Fluid milk	55.30 gal.	476 lb.	46
Butter	17.82 lb.	374 lb.	36
Cheese	4.36 lb.	44 lb.	4
Condensed and evaporated milk	14.32 lb.	36 lb.	3
Ice cream	2.77 gal.	38 lb.	4
All other uses of milk, such as powdered milk, powdered cream, malted milk, sterilized milk, etc.	.....	72 lb.	7
Total consumption of all milk products in terms of whole milk	.....	1,040 lb.	100

[1] Source: Bureau of Agricultural Economics, Department of Agriculture.

Table IV—Estimated Per Capita Consumption of Chicken Eggs[1]

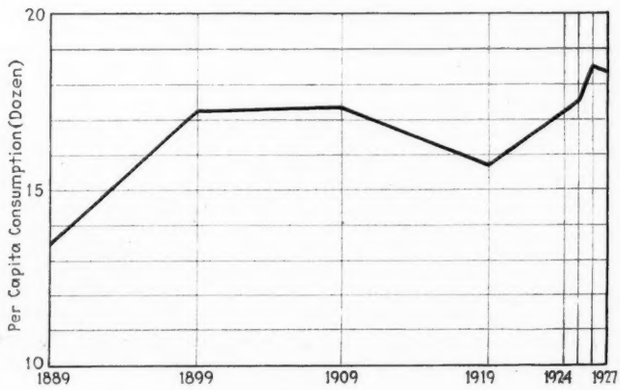
Year	Production of Shell Eggs (Million Dozen)	Apparent Total Consumption (*b*) (Million Dozen)	Apparent Consumption per Capita (Dozen)
1889	820 (*a*)	834	13.5
1899	1,294 (*a*)	1,288	17.2
1909	1,575 (*a*)	1,570	17.3
1919	1,654 (*a*)	1,650	15.7
1924	1,913 (*a*)	1,952	17.2
1925	2,003	2,016	17.5
1926	2,120	2,163	18.5
1927	2,162	2,175	18.3

[1] From Production Estimates 1925-27 and Cold Storage Holdings 1924-27 from Department of Agriculture; 1889-1919 and 1924 production figures from the Bureau of the Census. Imports and Exports from Bureau of Foreign and Domestic Commerce.
(*a*) Includes estimates of incomplete reports.
(*b*) No deduction has been made for the eggs used for hatching, which amounts to quite a large number being generally averaged as approximately 2½ eggs for each chicken raised.

Statistics on egg consumption are even less reliable than those for dairy products. Taking them as they are, largely decennial Census figures, there is an indication that in 1899 our consumption of eggs was between 17 and 18 doz. per capita. The latest figures available, for 1927, indicate only a trifle higher consumption; the difference between these recent figures and the earlier ones appears to be rather a result of more complete reports than of any actual increase in consumption.

In poultry consumption also we have very incomplete statistics, as the early Census figures gave only the number of chickens on hand at a certain date or the number of chickens produced within a year. It should also be remembered that 30 years ago a large part of the poultry was of local production and consumption. About the best guess that can be made of consumption in 1899 is in the neighborhood of 20 lb. per capita. The consumption for the five-year period, 1920-1924, was a little over five chickens per capita; these are estimated to have weighed approximately 20 lb., based on trade information that the average commercial chicken weighs in the neighborhood of 4 lb. apiece.

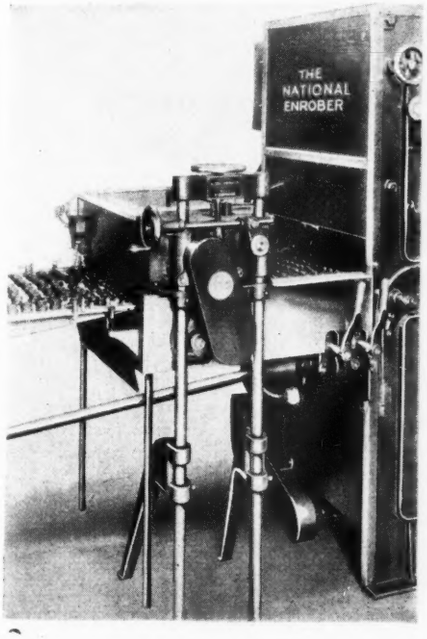
Fig. 4—The annual per capita consumption of hens' eggs is over eighteen dozen



Manufacturers' News And Equipment

Assorted Decorations for Enrober-Coated Confections

MACHINE-COATED confections are said to be decorated as attractively by the Bausman chain decorator as by hand dippers. This mechanism, which can be attached to 16-in., 24-in., or 32-in. enrobers, is manufactured and installed by the National Equipment Company, Springfield, Mass. It lends itself to producing confections at the

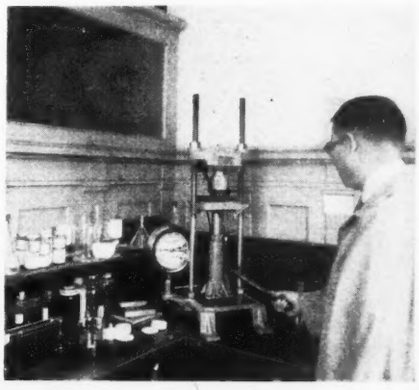


normal capacity of the enrober. The designs may be assorted or individual and are adaptable to pieces varying in size and shape.

New Tool for Food Research

A HAND-OPERATED hydraulic press, fitted with chromium-plated parts and capable of producing results on a small scale, comparable to those desired on a commercial basis, has recently become available to the food research chemist.

Constructed to produce pressures as high as 16,000 lb. per square inch, this press is said to be finding application in the examination of oil-bearing seeds and fruits to determine the quantity and general character of the expressible oil and the residual cake; in obtaining concentrated natural juices or extracts from selected types of food products; and in determining the effects of pressure or pressure and temperature on various classes of food materials.



In developing this press, Fred S. Carver, 90 West St., New York City, has equipped it with a large gage calibrated to give direct readings and to show total loads, as well as hydraulic pressure.

Chromium-plated press cages, rings, filter-press pots, and pads in addition to electric hot plates, fitted with thermometer wells, and other equipment commonly used with a press of commercial capacity give this tool a wide range of applications.

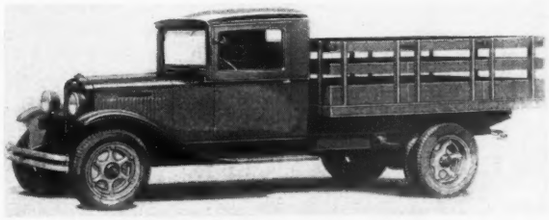
New Popular Priced Medium-Duty Truck

DODGE Brothers Corporation, Detroit, Mich., has recently placed a 1½-ton model truck on the market to sell for $595. It is offered in four standard body types: panel, express, platform, and stake, and contains construction features such as a full-floating rear axle, internal hydraulic four-wheel brakes, full force feed lubrication, 10-in. single-plate clutch, 7-in. frame, 136-in. wheelbase, 48-hp. motor, and four-speed truck transmission.

It is claimed that the full-floating rear axle has a large and rugged housing which carries the full weight of the chassis and load; the full-inclosed four-wheel internal-expanding, hydraulic brakes are weatherproof and automatically equalized; and that the four-cylinder engine has a bore and stroke of $3\frac{3}{8}$x$4\frac{1}{4}$ in. and a total piston displacement of 196 cu.in. Aluminum alloy pistons are used and fuel is fed by means of a pump driven off the camshaft. All gears are of chrome vanadium steel, heat-treated and hardened; the gasoline tank has a capacity of 15 gal. The standard driver's cab is said to be roomy and comfortable with full-vision windshield.

A 6-cylinder truck engine and dual rear wheel equipment can each be furnished in this model at increased cost.

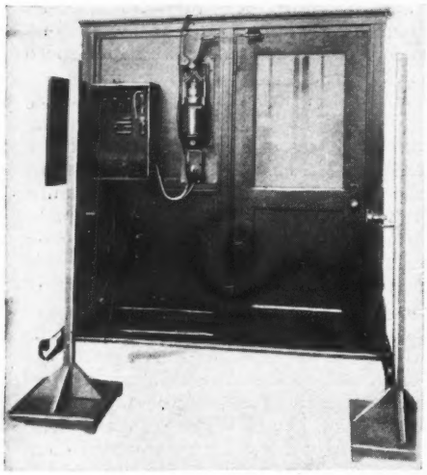
New general utility truck



Door Opens Automatically

AN AUTOMATIC door opener was recently demonstrated by the General Electric Company, Schenectady, N. Y. As the individual approached the door, his body interrupted a ray of light which was focused on a photo-cell several feet from the door. The slight current in the photo-cell was amplified through three larger vacuum tubes; the last one a power tube. This stepped-up current set in motion a small motor that operated a hydraulic lever mechanism, which in turn forced open the door. An adjustable control regulated the length of time the door was held open to permit the individual to pass through.

An installation of this equipment should find practical application in factories, offices, hotels, stores, and the



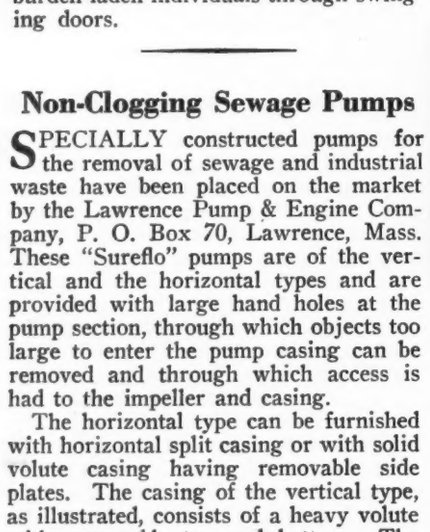
like where there is frequent passage of burden-laden individuals through swinging doors.

Non-Clogging Sewage Pumps

SPECIALLY constructed pumps for the removal of sewage and industrial waste have been placed on the market by the Lawrence Pump & Engine Company, P. O. Box 70, Lawrence, Mass. These "Sureflo" pumps are of the vertical and the horizontal types and are provided with large hand holes at the pump section, through which objects too large to enter the pump casing can be removed and through which access is had to the impeller and casing.

The horizontal type can be furnished with horizontal split casing or with solid volute casing having removable side plates. The casing of the vertical type, as illustrated, consists of a heavy volute with removable top and bottom. The impeller is of open type with side blades and large passages and may be made of bronze, cast iron, steel, or other special alloys.

Pumps with a 3-in. opening will pass solids with a diameter of 2 in. and have a capacity of 250 g.p.m. and those with a 12-in. opening will pass solids with a 7-in. diameter and have a capacity of 4,000 g.p.m. They have heads ranging from 20 to 50 ft., according to size of motor used.



Nirosta Exhibit in New York

EQUIPMENT applicable to the food industry is included in the exhibit displayed by the Krupp Nirosta Company in the New York Central Building, New York City.

The milk can shown in the illustration is of the type used in Germany for pasteurizing milk in small lots. This article along with such others as containers for fruit juices, cooking utensils, wire screens, sinks, seamless pipe, bolts, screws, plugs, and the like commonly used in food processing, when made from the Nirosta alloys, is said to be highly resistant to corrosion and to the effects of high temperatures and pressures.

This exhibit, which is maintained by the Krupp Nirosta Company for the 48 American steel manufacturers licensed to produce these alloys, includes specimens of these corrosion-resistant materials in cast, rolled, drawn, spun, welded, wire, etched, and riveted forms.

Unique Conveyor

SCREW CONVEYORS in the past have been adaptable only to the handling of bulk materials. Through a new application of the screw principle, packages—principally in the form of bags, bales, barrels, and cases—may be handled to and from storage, anywhere in the plant, at the will of the operator, by means of the new "TwinVeyor" made by the Clark Tructractor Company, Battle Creek, Mich. This machine is best explained in conjunction with the accompanying illustration, which shows bags being handled at the rate of 1,800 per hour in a large sugar refinery.

The conveyor consists of a motor and power head which drives two spiral tubes, upon the surface of which are spiral beads for advancing the packages. The tubes are driven in opposite direction and move the packages at the rate of 90 ft. per minute. For ease in handling, each tube is 8 ft. long, and is coupled to the next in the series at a bearing point which permits a flexibility of 15 deg. The conveyor is said to operate up a 30 per cent grade.

The manufacturer claims that one of the principal features of this conveyor is its easy portability. Special supports for the bearing points are not necessary as is indicated in the photograph. Other features include flexibility of length and inclination, high speed, and large capacity.

▸▸ Manufacturers' Publications

Evaporators—Evaporators for the production of boiler feed make-up water are described in bulletin No. 361 published by the Griscom-Russell Company, 285 Madison Ave., New York. This is a 36-page booklet illustrated by photographs and diagrammatic drawings and containing a partial list of users and the G-R evaporator system.

Tram Rail—The Cleveland Crane & Engineering Company, Wickliffe, Ohio, calls attention to its electric tram-rail installation in an illustrated leaflet. The installation is shown as applicable to handling of coal, washing of windows, and transferring of dough and bread in bakeries.

Nielsen Survey—In a neatly bound and well-arranged pamphlet the A. G. Nielsen Company, New York, gives a sample of the type of work it does. This survey is entitled "Buflovak Double Drum Dryers on Skim Milk, as Used by the Daniel Franklin Creamery."

Monorail System—In a 16-page pamphlet, known as bulletin No. 101, the Louden Machinery Company, Fairfield, Iowa, describes its monorail system for handling and transferring of materials in industrial plants. This pamphlet is illustrated by photographs and diagrammatic drawings.

Merck's Index—Merck & Company, Inc., Rahway, N. J. announces the fourth edition of its encyclopedia of drugs and chemicals.

Acid Pump—In a leaflet illustrated with halftones and diagrammatic drawings the Oliver United Filters, Inc., New York, N. Y., describes and suggests uses for its acid-resisting pumps lined with Olivite.

Frozen Foods Case—By photograph and diagrammatic drawings illustrating the appearance and construction of the firm's display and storage and service case, the Weber Showcase & Fixture Company, 5700 Avalon Blvd., Los Angeles, Calif., is acquainting the retail merchants with its latest developments.

Malt Products—In a leaflet devoted mostly to the valuation of malt as a food, the Schreiber Products Corporation, Buffalo, N. Y., lists the malt products manufactured and marketed by the company.

Centrifugal Pumps—Bulletin 401, compiled by F. E. Switzer, professor of hydraulic engineering, Cornell University, has been published by Goulds Pumps, Inc., Seneca Falls, N. Y. It is a practical handbook of data valuable to technical students, instructors, trained engineers, and pump operators covering every phase of the centrifugal pump from theory to installation and operation.

◂◂ What's on Your Mind?

To the Editor of FOOD INDUSTRIES:

It has been with real interest that I have read Dr. Bigelow's letter in your September issue congratulating those refining companies who have been engaged in research and investigational work designed to assist the canning industry.

Let me assure Dr. Bigelow that a careful study of Dr. Cameron's publications on the subject, as well as other pertinent literature, formed an integral part of our investigations.

We will look forward with interest to Dr. Cameron's detailed statement discussing the moot points involved.

Yonkers, N. Y. C. D. INGERSOLL,
Spreckels Sugar Products Laboratory
Spreckels Sugar Corporation.

* * *

To the Editor of FOOD INDUSTRIES:

In the July issue of FOOD INDUSTRIES, there appeared a communication from Dr. C. D. Ingersoll, of the Spreckels Sugar Corporation, in which he commented on the question of thermophilic contamination of sugar and its relation to canners' problems. The letter evidences a misconception of the problem or a misinterpretation of the available data, and I desire to comment on some of the points in Dr. Ingersoll's statement.

His premise is incorrect. To be specific, the letter opens with the statement:

> Previous allegations that *cane sugar alone* is responsible for the introduction of thermophilic bacteria in canning processes are hardly in accord with the evidence. Some few years ago, Dr. E. J. Cameron, of the National Canners' Association, investigated several plants where thermophilic contamination caused considerable damage. The results of this investigation led him to believe that cane sugar was the medium of introduction of thermophiles in the canning and *the cause of the whole trouble.* (The italics are mine.)

We have never made the statement that cane sugar alone is responsible for contamination difficulties. We have never published a conclusion that cane sugar was the whole cause of any trouble. We have never singled out *cane* sugar as a medium of infection. As regards source or method of manufacture, we have not distinguished between beet and cane sugar. We have, on the other hand, regarded sugar generally as an outstanding medium to account for the initial contamination of canning equipment.

To support the foregoing I quote all the "Specific Conclusions" as given on page 8 of our Bulletin 25-L, which is the only publication specifically referred to by Dr. Ingersoll:

> 1. Spores of thermophilic spoilage bacteria are rarely found in soil or on the raw product as canned.
> 2. Manure has been found to carry spores of spoilage thermophiles, and when it is used for fertilizer it may correspondingly vary the numbers of these spores found in soil. Resultant effect upon the numbers of spoilage bacteria carried by the raw product appears to be slight.
> 3. Thermophilic contamination in the canning of peas and corn is increased by a plant shut down. Such contamination is usually greatest after the over-night shutdown. Under uninterrupted plant operation there is a steady decrease in contamination.
> 4. Wooden tanks used in the preparation of brine may become inoculated with spores of spoilage bacteria, and thereby become primary sources of contamination. Wooden tanks used for storage of hot water may be similarly contaminated.
> 5. In the canning of peas, the blanching and filling units may become contaminated.
> 6. In the canning of corn, the cooking-filling system may become contaminated.
> 7. Sugar used in making brine, is an outstanding source of spoilage thermophiles in accounting for the initial inoculation of brine tanks.

On page 8 the following statement also occurs:

> Outbreaks of spoilage in canned peas have been traced to (1) wooden tanks used for the preparation of brine and (2) a wooden tank used for the storage of hot water. Additional sources of contamination have been found to reside in (3) wooden blanchers, (4) metal blanchers, (5) "squirrel-cage" washers following the blanchers, and (6) filling machines.

On page 11 of the report, under the heading "Relation of Sugar to Canning," the following is the opening statement:

> It is probable that sugar is rarely so highly contaminated as to lead to direct spoilage. It seems certain, however, that thermophilic spoilage infection may be carried by sugar and thus inoculate various units of the canning machinery, and at these points the contamination may develop to an extent where it will become a factor of spoilage.

From page 42 I quote the final statement of the "General Discussion":

> "Referring specifically to the canning of peas and corn, it now appears that when a thermophilic spoilage outbreak is experienced and when this may be traced to the activity of spoilage thermophiles surviving the process, the casual infection may not be associated with the condition of the raw product at the time of harvesting, or at the time of canning. Rather, it appears most general that such infection has been the direct result of thermophilic bacterial development within the canning plant, and most particularly where heat has been employed for purposes of brining, cooking, or blanching.

How could such statements be construed as placing liability on sugar to the exclusion of all other factors?

Dr. Ingersoll's remarks made with reference to blancher contamination convey nothing that is new. We have, of course, regarded thermophilic contamination of blanchers as something entirely apart from the question of sugar infection. But here it must be emphasized that when peas are blanched in water containing spores of spoilage thermophiles, only a small part of the contamination will be picked up by the peas, and this will be largely removed by the wash which follows blanching. It is universal practice to wash after blanching.

On the other hand, whatever contamination is in the brine will go into the can. None of the existing operations will remove it. This, then, is a factor which makes doubly important the bacterial condition of the sugar.

Dr. Ingersoll states: "The question resolves itself in my mind to a matter of plant cleanliness and sanitary measures." Other statements are made which carry this thought. Obviously, he excludes sugar as a factor and correlates thermophilic contamination directly with sanitation.

There is no such correlation. Thermophilic spoilage has occurred in canning factories where an allegation of unsanitary practices would be considered ridiculous. It is of interest to note that a similar observation has been made with reference to the lack of sanitation significance where thermophiles are found in milk pasteurizing equipment. I quote from the abstract of the paper presented by Breed, Prickett, and Yale at the thirtieth annual meeting of the Society of American Bacteriologists (*Jour. Bact.*, Jan., 1929, page 37). "As their presence [referring to thermophiles] in large numbers is due largely to favorable temperatures, these bacteria do not have an intimate connection with unsanitary practices."

If Dr. Ingersoll's premise were correct, the high thermophilic contamination noted in various samples of sugar could be taken as an unfortunate reflection on the sanitary condition of some branches of the sugar-refining industry.

Apparently, Dr. Ingersoll has failed to recognize the specific thermophilic types which are of importance to canning. He distinguishes between the thermophiles which form spores and those which do not, but stops there. There is no indication that he recognizes differential characteristics among the spore-forming thermophiles. His remark that thermophiles may be found almost universally in every food product indicates that he attaches the same significance to the aerobic thermophilic spore formers as he does to those with which we are concerned.

The statement that "Thermophilic organisms come under the classification of the soil bacteria . . . " is open to academic discussion with especial reference to the field of systematic bacteriology. As a matter of fact, Dr. Ingersoll would be unable to find a detailed description of any of our three recognized general groups of spoilage thermophiles in any treatise on soil bacteriology. Further than this, if tests for spoilage thermophiles were made on a dozen samples of sugar and a dozen samples of soil, all samples picked at random, my experience tells me that these bacteria would be found in the sugar far more frequently than in the soil. Indeed, it would be most unusual if flat sour bacteria were isolated from the soil. It is significant that the flat sour bacteria are the most common of the spoilage thermophiles and are those most frequently found in sugar.

The facts of the case have been determined. They are available and they can be demonstrated. I have made definite citations to them in order that those who read Dr. Ingersoll's letter may have the record correct. That large refining companies have already acted upon those facts is sufficient answer to Dr. Ingersoll's letter.

Washington, D. C. E. J. CAMERON,
Research Laboratories
National Canners' Association

News of the Month

Work on Canned Food Standards Makes Steady Progress

By Paul Wooton
Washington Correspondent

PROGRESS made in the formulation of standards for canned goods under the Mapes law indicates that hearings will be held in December. Tentative definitions of a reasonable standard of quality, condition, and fill of containers for a variety of canned vegetables and fruits, and the equivalent physical and chemical constants, are evolving gradually in the laboratory of the Food and Drug Administration. As the definitions must be sufficiently broad to cover any grade from extra fancy to the lowest that is normally recognized as standard, it is a difficult task.

The administration's method of procedure is illustrated by its work in arriving at a commercially practicable standard for peas. Two series of samples, representing typical packs of both high and low grades, were collected and the crushing strength was determined for the pea at the bottom of the scale acceptable as standard. This factor has been translated into a numerical figure by a simple mechanical device that can be used in the canning plant. Appropriate methods also have been developed for establishing the size, color, and clarity of liquid in the canned product which constitutes the line between standard and substandard.

Standards for tomatoes, corn, peas, string beans, peaches, apricots, apples, pears, cherries, and salmon have been roughed out, and enforcement officials express the hope that they will be acceptable to canners, distributors, and consumers. They will become effective with next season's output upon 90 days' advance notice in every instance.

The wording and form of the label that the Mapes act requires on canned goods which fall below the established standards is calling for considerable thought both in the Food and Drug Administration and in the trade. To carry out the intent of the law this label must clearly inform the purchaser that the product falls below the standard, but it is also apparent that such designation should not imply that the product is unfit for food. To evoke discussion the administration has suggested "Below U. S. Standard" for designating substandard goods. This statement has the advantage of brevity and therefore would be conspicuous, but it is criticised because it does not explain to the purchaser an apparent contradiction, which is that a product can fall below a standard established under the Food and Drug Act and at the same time be of a quality that will pass muster as legal under that act. Attempts to formulate a statement that conveys this distinction to the purchaser invariably have resulted in too "wordy" an explanation. It is probable, however, that the invention of a label will occupy considerable attention at the forthcoming hearings.

Sugar Crop Prospects Show Further Overproduction

WITH a large part of the sugar-growing industry already near ruin due to overproduction, a more desperate situation at the end of this season appears inescapable. In an address before the Mill Owners and Planters' Association on Sept. 16, President Machado of Cuba estimated that the 366,700 acres of new land planted to cane this year in that country would yield an additional 6,000,000 bags of sugar over last years crop. Coincidentally, it is reported that Colorado's beet tonnage this year, barring unforeseen weather conditions, will establish a new record with 3,120,000 tons. The previous production record was 2,912,000 tons in 1926.

The world situation is complicated by the fact that the 1930 production estimate for beet sugar in Soviet Russia is 2,200,000 tons, as compared to a yield of 921,000 tons in 1929. This production will place Russia definitely in the ranks of sugar-exporting nations, and although most of the sugar will go to Oriental countries, its influence in curtailing the market for Cuban sugar will undoubtedly affect the situation in the United States.

Cognizance of the impending increase in overproduction troubles has led the Sugar Beet and Sugar Cane Advisory Committee, an organization of domestic beet and cane producers who act as an intermediary between the industry and the Federal Farm Board, to seek the "moral support" of the Board in its efforts to get a higher duty on sugar. The rapid increase in duty-free imports of sugar from the Philippine Islands also was cited as a problem of domestic sugar growers which the Federal Farm Board should aid in controlling. Imports from the Philippines were referred to as an "ever-increasing menace" in the report.

For correcting wasteful practices in marketing, the committee said: "In the solution of this important problem, we recommend authorization by the Federal Farm Board of a centralized marketing agency or clearing house under Section 10 of the Farm Act. Such a clearing house we believe should include in its membership not only the producers of beets and cane but also the processors of continental beet and cane sugar, as well as the west coast refiners of Hawaiian cane sugar. . . . It may be possible also that as the scheme develops it will be necessary, if the Federal Farm Board should decide it to be legal and permissible under the Agricultural Marketing Act, to admit Eastern and Southern seaboard refiners to membership in the clearing house."

COMING EVENTS

OCTOBER

5-7—National Poultry, Butter, and Egg Association, Chicago, Ill.
15-16—American Cheese Makers' Association, Thorpe, Wis.
11-19—National Dairy Exposition and St. Louis Fair, St. Louis, Mo.
17-22—Institute of American Meat Packers, Drake Hotel, Chicago, Ill.
20-25—Dairy Industries Exposition, Cleveland, Ohio. International Association of Milk Dealers, Hotel Statler, Oct. 20-22; International Association of Dairy and Milk Inspectors, Hotel Statler, Oct. 22-24; International Association of Ice Cream Manufacturers, Hollenden Hotel, Oct. 23-25.
21-22—Associated Grocery Manufacturers of America, Hotel Traymore, Atlantic City, N. J.
27-29—Mayonnaise Products Manufacturers' Association of America, Chalfonte-Haddon Hall Hotel, Atlantic City, N. J.

NOVEMBER

8-15—Pacific Slope Dairy Show, Oakland, Calif.
10-14—American Bottlers of Carbonated Beverages, Milwaukee Auditorium, Milwaukee, Wis.
11-14—Association of Dairy, Food, and Drug Officials of the United States, New Orleans, La.
13-14—American Oil Chemists' Society, Congress Hotel, Chicago, Ill.
18-19—National Creamery Buttermakers' Association, Minneapolis, Minn.

Straws in the Business Breeze

AS THIS number of FOOD INDUSTRIES goes to press, gentle breezes of business recovery seem to promise fairer skies for October than those of September or any other recent month. The index of business activity, prepared by *The Business Week* for the week ending Sept. 20, the latest available figure, is 85.6 per cent, whereas the previous week it was 84 per cent and the one before that but 83 per cent.

Indications in the exchanges are that the bears are desperately trying to wring the last drop of profit from the short side. If precedents hold, this marks the last stages of deflation. Building and general trade show more than seasonal improvement. Most industrial activities show some betterment, but rather less than September should bring. President Green of the A.F.L. reports a definite upturn in the employment of union labor.

Overproduction in basic commodities, such as sugar and wheat, continued low prices in many lines, and lack of vigorous action by the Federal Reserve and business leaders, are factors that tend to slow the rate of recovery. Expectation of a full return to normal levels during the remaining months of the year seems unwarranted.

Trade With South America Discussed at Sacramento

FOOD PRODUCTS occupied an important place in the deliberations of the first Pan-American Reciprocal Trade Conference, held in Sacramento, Calif., Aug. 24-30. International trade in food and agricultural products, pure food laws, quarantine regulations, fruit culture, and the tariffs on food products were treated. Seventeen of the 21 American nations were represented at the conference with about 100 delegates. "Obstacles to reciprocity" was the general theme of all the discussions.

While practically everyone had some objection to the United States tariff, the discussions developed the fact that the South American countries objected to each other's tariffs, as well. Thus Chile objected to the high Brazilian tariff on fruit and wine, while Cuba was of the opinion that everybody's tariff on sugar and tobacco was much too high. Cuba. Mexico, and Argentina, were the most vigorous objectors to the United States' tariffs.

Argentina would like very much to ship fruit to the United States, particularly to California. At the present time this is not permitted under the Federal Quarantine Act, and all shipments must arrive at the port of New York, where they are allowed to enter subject to certification and inspection for fruit pests. Many of the South American and Central American countries seem to feel that the quarantine act is merely an adjunct to the tariff and is often used to exclude fruits that are not contaminated with pests.

The subject of coffee came up at several sessions. Haiti made a bid for the coffee market in the United States when her delegate declared that Haiti grows the best coffee in the world. Brazil is somewhat worried because the consumption of Brazilian coffee in the United States has fallen off in the last few years. During the conference on pure food laws, the rather sweeping accusation was made that a great deal of the coffee sold in the United States is adulterated with chicory. While officials of the Food, Drug, and Insecticide Administration denied this, they could do so, of course, only for products moving in interstate commerce and had to admit the possibility of such adulteration in intrastate sales, whereupon a resolution was passed, inviting state and municipal food inspection authorities to investigate the adulteration of coffee.

It was pointed out in the conference on the pure food laws that some of the South American countries have various restrictions that are no longer tenable in the light of modern scientific knowledge.

No Change Is Foreseen in Corn Sugar Regulations

TWO months have passed since the hearing on modification of the Food and Drug Act regulations sought by corn sugar manufacturers to permit the use of this product without label declaration. There has been no intimation of an announcement by Secretary of Agriculture Hyde and there is some reason to believe that none will be forthcoming. It is understood that at the time he granted the hearing Secretary Hyde was prepared to render an immediate decision. The delay indicates that he is moving with extreme caution and in some quarters it is regarded as more than probable that there will be no decision at all.

Representatives of the corn sugar manufacturers presented an elaborate argument for removing the alleged discrimination against dextrose, but during and since the hearing last July an enormous amount of opposition has developed to their proposal.

Mobile Laboratories for Milk Survey

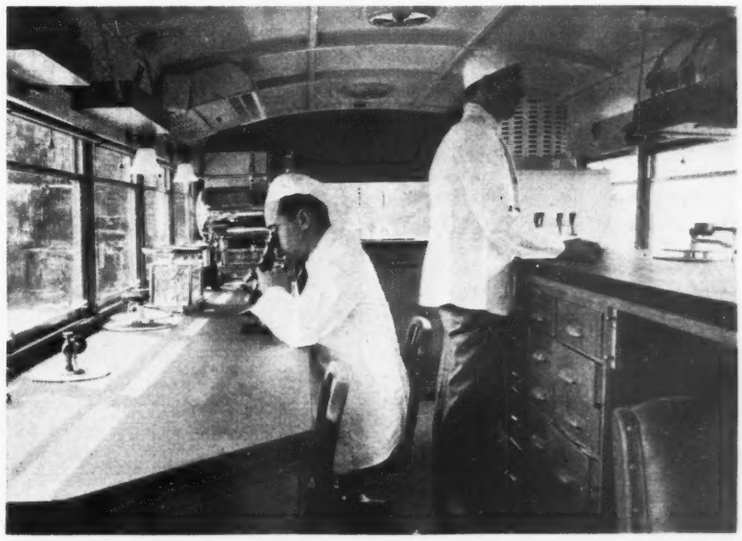
TWO laboratories on wheels have just been put into operation by the New York State Department of Health to provide facilities for accurate examination of milk samples anywhere in the state. The laboratories will be used in the milk-supply study authorized by the last legislative session to bring about more effective sanitary control.

Passenger buses were adapted for the purpose of removing the usual seats to provide a space of 7x18 ft. for equipment, according to a description in *Health News*. Laboratory benches are installed along the sides and across the back of each bus, and a sink with hot and cold running water is provided, a small water storage tank under air pressure which may be filled from outside the bus serving as a source.

Most of the equipment is electrical; there is an electric water heater, an electric incubator, refrigerator, autoclave, sterilizing oven, unit heater, fans, lights, and the like. Although the incubator is operated by storage batteries, most of this equipment makes use of an electric meter fitted with long lead-in wires to connect the bus to a 110-volt power circuit when the bus is standing at milk stations and plants. A Babcock tester for butter fat determinations, as well as microscopes and other equipment for bacteriological examination of samples, are included in the equipment.

In addition to determination of the sanitary qualities of the larger milk supplies throughout the state, the two traveling laboratories will make possible more or less pioneer work in some of the strictly rural communities, the report states.

Interior view of one of the new traveling laboratories



Canning Crops Show Slight Improvement; Regional Variation Is Great

LOCAL relief from the drought in the principal canning areas has not been sufficient to improve canning crop prospects materially. Because of an increase in the tomato estimate, the Sept. 1 forecast of the four major canning crops by the Department of Agriculture was slightly more favorable than that of Aug. 15.

Production of snap beans, sweet corn, green peas, and tomatoes for canning now is estimated at 2,281,000 tons, which would be 6 per cent below last year's output but nearly 7 per cent greater than the annual five-year average production. An ample supply of beans, peas, and tomatoes is in prospect, but the supply of sweet corn will be very light. The National Canners' Association has issued a timely broadside condemning the practice of canning field corn and the Food and Drug Administration is preparing to take vigorous action against canners who offend in this respect. All shipments of canned field corn that are not labeled as such are subject to seizure.

Forecast at 576,700 tons Sept. 1, as compared with 589,500 tons Aug. 15, the production of corn is 18 per cent less than in 1929 and 14 per cent below the 1924-1928 average. Reductions in probable yields in Iowa, Illinois, Ohio, Michigan, New York, Pennsylvania, and Delaware have been offset to some extent by higher yields in Minnesota, Indiana, and the New England states. Planted acreage is 11 per cent larger this year than in 1929, and more than 25 per cent larger than the five-year average, but the indicated yield of 1.45 tons per acre is the lowest on record since official estimates were started in 1918. Although no information is available yet on the number of cases packed per ton this year, it probably will run below average in the drought areas.

Snap-bean production of 78,700 tons is 13 per cent below last year's output, but is nearly half again as large as the five-year average, due to the rapid expansion of acreage during the past two seasons. The Sept. 1 forecast was only 1,150 tons below the Aug. 15 estimate.

Tomato crop prospects were improved by rain, and the Sept. 1 estimate of 1,401,180 tons represented an increase of 34,850 tons over the Aug. 15 estimate. This compares favorably with last year's production of 1,426,170 tons, and is one-sixth larger than the five-year average.

The preliminary estimate places the production of green peas for canning at 448,275,000 lb., 10 per cent larger than either the 1929 or five-year average output. On an acreage 12 per cent larger than last year, the estimated yield per acre of 1,720 lb. is 2 per cent less than last year's low yield.

The first forecast of production of cabbage for kraut, based upon condition of the crop Sept. 1, is 144,900 tons, compared with a production of 140,300 tons in 1929, or an increase of 3 per cent over that of last year. On an acreage about one-fifth larger than that grown in 1929, the indicated yield per acre is only 7.1 tons, compared with 8.3 tons last year and with a five-year average yield of 10.4 tons for the period 1924-1928.

The Sept. 1 forecast of production of cucumbers for pickles, based on condition of Sept. 1, is 4,942,000 bu., compared with a production of 3,265,000 bu. in 1929, or an increase of approximately 50 per cent over the unusually light production of last year.

Food Taste and Appearance To Be Evaluated

THE influence of taste, odor, and appearance of foods upon the likes and dislikes of individuals and the consequent effect of state of mind upon digestive processes will be investigated by Donald A. Laird, head of the psychological laboratory at Colgate University, it was recently announced.

An outgrowth of experiments carried on last year to determine the value of sugar in overcoming fatigue, the new series of experiments will attempt to apply scientific procedure to the evaluation of the purely psychological factors in eating. Although the "appetite appeal" of foods has been generally recognized by manufacturers, factors which control this appeal have not received the objective type of study that has characterized work on calories, vitamins, and other studies in which the body is treated as a chemical machine. Since the consumption of food is still largely determined by what tastes good to the individual, rather than what dietetic analysis reveals to be good for him, the experiments should reveal data of considerable value to food manufacturers.

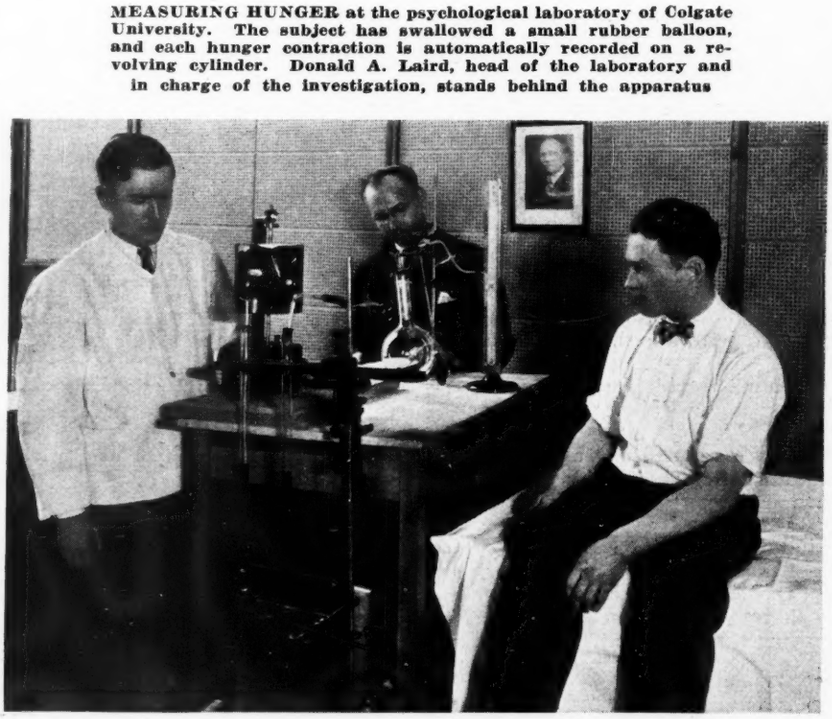
According to the *Lab Log*, a pamphlet published by the laboratory and in which the work is described: "Authorities recognize that the process of digestion is directly influenced by psychological factors as well as by the chemical constituents of the food eaten, and that the eater's whole temperament may be affected by good or bad digestion. There has, however, been a dearth of scientific work to measure these effects, not to mention the desirability of having a practical guide for common tastes and smells.

"Some experimental work which has been done with offensive odors and tastes has shown significant effects upon digestion. We will simply run down the effects of common table and kitchen odors and flavors, and then go one step further in the field of moods and temperament.

"Part of our work will deal with the effects of sweet foods, and the different effects, if any, of foods seasoned in the more customary manner and then given an additional seasoning consisting of a small amount of sugar. Various methods of bringing out ordinary flavors will also be used.

Measurement of stomach contractions, as carried out in former experiments by Dr. Laird, will offer valuable insight in the investigation. Measurement of flow of saliva and gastric juices, acidity of stomach contents, rate of digestion, and chemical analysis of the foods will be correlated to various states of mind. Byron S. West, M.D., will work with Dr. Laird, and F. I. Tomlins, of Ridgewood, N. J., will be chief chemist.

MEASURING HUNGER at the psychological laboratory of Colgate University. The subject has swallowed a small rubber balloon, and each hunger contraction is automatically recorded on a revolving cylinder. Donald A. Laird, head of the laboratory and in charge of the investigation, stands behind the apparatus



Accident Prevention in Food Plants To Be Discussed

ACCIDENT prevention in the food industries will be one of the important topics treated at the 19th Annual Safety Congress and Exposition to be held at Pittsburgh, Pa., Sept. 29 to Oct. 3.

The food section will have four one-half day program sessions. One of the features will be a discussion of the topic "Safety Work as a Business Proposition," and a discussion of the topic "General Hazards in the Food Industry." The topic "Special Hazards in the Food Industry" will be discussed from the viewpoint of "cereal products," "hotels and restaurants," "dairy products and bottling," "baking and candy manufacturing."

The program for the meat-packing group will include a paper on "Fundamentals of Accident Prevention in the Packing and Tanning Industry," by E. H. Merrill, President of Peterson, Merrill Co., Inc. There will be an address on "Accident and Health Hazards in the Packing Industry," by Dr. V. S. Cheney, Armour & Co. One entire morning session of the program will be devoted to a discussion of the tentative safety code formulated by the Institute of American Meat Packers.

Lower Production Costs Is Theme of Bakers' Meeting

MORE than 5,000 bakers had registered at the convention and exposition held in Atlantic City up to Wednesday evening, Sept. 24. It was expected that last year's registration of 5,700 would be exceeded before the meeting came to an end. The amount and character of labor-saving machinery included in the exhibit emphasized the efforts being made for reduction of production costs throughout the industry. Old campaigners say that this year's exhibit outclasses those of previous years in size and completeness of correlated production units assembled on a plant-operating scale to give actual demonstrations.

The bakers' school being conducted each afternoon in connection with the convention has also stressed cutting of production costs by demonstrating how to increase shelf-life of products, how to make them more attractive in appearance without increasing materials costs, and how to produce the same quality and volume of products at a lower cost by more intelligent use of equipment and materials. A more complete report on the papers presented at the convention will appear in next month's issue of FOOD INDUSTRIES.

Fermentation Discussed By Chemical Society

INCREASING influence of chemical investigation on the technology of food processing was significantly emphasized by the outstanding interest with which papers in this field were received at the eightieth annual convention of the American Chemical Society, held in Cincinnati, Ohio, Sept. 8 to 12. Among the hundreds of papers, the symposium on industrial fermentation, much of which was centered around the food industries, appeared of greatest interest.

The discussion of fermentation opened the technical sessions at a general meeting on Tuesday morning. E. I. Fulmer, of Iowa State University, spoke on "The Chemical Approach to Problems of Fermentation," dwelling upon the complexity of the chemical changes brought about by micro-organisms on carbohydrates, and the need for adequate quantitative methods of analysis. Following papers on ethyl alcohol and lactic-acid fermentations, Charles N. Frey, of Standard Brands, Inc., maker of Fleischmann yeast products, told of the developments in the manufacture of yeast in connection with the baking industry.

The importance of fermentations in the food industries as a group was treated by F. C. Blanck, of the Food Research Division of the Bureau of Chemistry and Soils, U. S. Department of Agriculture. He described the conditions necessary for satisfactory fermentation of sauerkraut and pickles and told of the growing popularity of acidophilus milk. Fermentations of citric, acetic, gluconic, and gallic acids, were described in a paper by O. E. May and H. T. Herrick, of the Bureau of Chemistry and Soils.

A meeting of the division of agriculture and food chemistry held Tuesday afternoon also brought out material of considerable interest to food manufacturers. Evaporated milk for infant feeding, factors in sulphuring apricots, and a study of the various methods of determining sulphur dioxide were included.

Sugar chemistry, which made up one of the divisions that met on Wednesday, was treated from both the scientific and industrial viewpoints.

Chocolate, Chewing Gum, and Cheese Confuse Courts and Commissions

NO, THEY haven't been mixed by some enterprising maker of gastronomical novelties with a flair for alliterative names. But there has been a mix-up—in fact, three mix-ups — over what the names, taken individually of course, really represent.

Just at present the Supreme Court of the United States is scratching its august head, figuratively speaking, to decide just who is mixed up about the chocolate — the Treasury Department of the United States or a group of chocolate manufacturers led by the Hershey Company. The companies paid the government about $8,000,000 in excise taxes under the Revenue Acts of 1918 and 1921 on the sale of sweet and milk chocolate as candy. But they don't believe that it's candy at all, and they want their money back. Already there has been a long battle. A district court ruled that the chocolate was candy; then the Circuit Court of Appeals, with a different angle on its sweet tooth no doubt, said that it wasn't. Now the question has gone to the Supreme Court on a petition from the government.

Manufacturers of chewing gum can't understand the chocolate men at all. While the latter are fighting against the candy classification, the National Chewing Gum Manufacturers' Association, who wanted nothing more than to have their product so regarded, have found themselves turned down by the Interstate Commerce Commission.

All foods, including candy, are under the second classification rating and have special low rates. But the American Railway Express Agency, Inc., knowing that chewing gum ended up on the bottom of chairs rather than in the digestive system, felt differently about that product. A hearing took place several months ago to decide the matter. The gum makers showed that their product was considered a food under the Food and Drug Act; that it contained more food value, in the form of sugar content, than either celery or tomatoes, and that it was sold in competition with candy, but the Commission wasn't convinced that it was a food. Someone even suggested that it might be considered a drink, since the portion with food value was dissolved in the saliva and swallowed as a liquid; only parking regulations, presumably, applying to the rest. This was too much for the Commission; the hearing closed and several months elapsed. Evidently, since they couldn't swallow the gum, they couldn't swallow the arguments. Chewing gum, they have announced, is not a food, and not entitled to the special rates.

As for the cheese question, that isn't so hard to understand. In fact, the cheese isn't so hard to spread either, which is just what has made it the cause of quite a bit of confusion and possible violations of the Food and Drug Law, according to Dr. L. D. Elliot, of the Food Standards Committee. The result of mixing up cheese with about 1 per cent of water and 3 per cent of emulsifying agents isn't cheese at all, he said; it is "a cheese product" or "process cheese" and must be labeled as such. "The Food and Drug Administration makes no criticism of the product if properly labeled," said Dr. Elliott. And Camembert, no doubt, by any other name would smell as sweet.

TRADE NOTES

BORDEN COMPANY, New York City, has purchased the Hutchinson Ice Cream Co., Cedar Rapids, Iowa.

CALIFORNIA FISH CANNERS' ASSOCIATION is the new name of the organization formerly known as the Sardine Canners' Association of California, according to R. E. Ludlam, secretary of the reorganized group. The association office is now located at 149 California St., San Francisco.

FRIGIDAIRE CORPORATION has brought suit against George Nitterhouse and Noel Nitterhouse, of Indianapolis, Ind., in the U. S. Court, Southern District of Indiana, charging trademark infringement. The use of the term "Frigidized Foods" by the Nitterhouse Bros. in a sales campaign some time ago is the point on which the suit rests.

GENERAL FOODS CORPORATION has announced that more than 66,000 shares of its stock have been subscribed for under the stock purchase plan offered to employees. Over 50 per cent of the eligible employees subscribed for stock under the offer that expired Aug. 1. These shares were paid for by monthly deductions from salary and do not include stock bought privately by employees nor that held by executives of the parent company and its fifteen subsidiaries.

GRAPEFRUIT DISTRIBUTORS, INC., has filed papers under the Export Trade Act with the Federal Trade Commission, for exporting citrus fruits and citrus fruit products and byproducts. The corporation will maintain offices at Davenport, Fla. Officers of the corporation are: Harry E. DiCristina, president and director; E. H. Dewson, vice-president, secretary, and director; and F. S. Bates, treasurer and director. The Export Trade Act grants exemption from the anti-trust laws to an association entered into and solely engaged in export trade, with the provision that there be no restraint of trade within the United States or restraint of the export trade of any domestic competitor.

HECKER - JONES - JEWELL MILLING COMPANY has been sustained by the Commissioner of Patents in its objection to the registration of "Red Ball" trademark by Consolidated Companies, Inc. The commissioner affirmed the decision of the examiner of interferences that the red disk which formed the dominant characteristic of the mark was confusingly similar to a disk used in the trademark "Heckers."

HERTLER & COMPANY, New Haven, Conn., recently opened their new sausage factory by a ceremony to which the public was invited. The plant is said to be one of the most modern and complete in the New England States.

ILLINOIS PACIFIC COAST COMPANY will be formed by a merger of the Pacific Coast Glass Company and the Illinois Pacific Glass Company, officials of both organizations have reported. Although details of the merger have not yet been worked out, it is understood that all four of the factories owned by the two companies will continue to operate, the only change being concentration of certain types of operation in the different plants. Two of the factories are in San Francisco and two in Los Angeles.

LIQUID CARBONIC PACIFIC CORPORATION announces the opening of its new plant at Seattle, Wash., for the production of carbonic gas and solid carbon dioxide. The DryIce Corporation of America will also maintain its northwest headquarters at this location, and the sales of "Dry-Ice" will be handled by direct sales organizations.' The daily production of solid CO_2 at this plant will be 10 tons per day. The new plant represents an investment of approximately $250,000.

LOFT, INC., has purchased controlling interest in the Happiness and Mirror Candy Stores from United Cigar Stores Company. The purchase also involves three candy factories, two in New York and one (Chocolate Products, Inc.) in Baltimore, Md. Former officers in the new subsidiaries have been succeeded by men connected with the Loft organization, Charles G. Guth now being president of all three of the organizations.

MARTHA WASHINGTON CANDIES COMPANY of California, Ltd., which was formerly operated under a leasehold system, has been taken over from its former operators by the parent company, Martha Washington Candies Company, Chicago, Ill. Hereafter it will be known as Martha Washington Candies Company, California Division.

MCGRAW - HILL BOOK COMPANY, INC., New York City, has announced that the trade publishing department will hereafter be known as "Whittlesey House." The name will be used to differentiate books for the lay reader from the strictly engineering and technical works.

NATIONAL BISCUIT COMPANY on Sept. 17, declared an extra dividend of 50c. on the common stock, payable Nov. 15 to stock of record Oct. 20. The company recently split its share to 2½ for 1 and reduced the par value from $25 to $10 a share.

NEW YORK COFFEE AND SUGAR EXCHANGE is working on the preliminary plan of revising the bylaws and rules of the exchange to permit trading in molasses future contracts if members of the exchange desire to add this activity, it was recently announced. Thus far, the committee in charge of the plan has agreed upon a contract calling for 24,000 gal. of molasses of 11.7 lb. each as a unit of trading. Fluctuations would be one-hundredth of a cent per gallon, with New Orleans as the one point of delivery.

NORTH PACIFIC OYSTER GROWERS' ASSOCIATION, a new co-operative marketing group, was formed by cultivators of Western oysters who met this month at Raymond, Wash. The marketed product will be known as Pacific Oysters. The president of the association is Myron T. Heuston, of Seattle, Wash.

SAN MARTIN CANNING COMPANY, INC., with factory at San Martin, Calif., recently established a distributing branch in San Francisco at 608 Sansome Street. This company cans tomato paste, vegetables, and genuine Mexican garbanzos.

STANDARD BRANDS, INC., successor to the Fleischmann Company, and the Federal Yeast Corporation, New York City, have reached a settlement following extended litigation concerning patents covering improvements in yeast manufacturing processes owned by Standard Brands. The matter first went to the courts in 1923 and it was held by both the district court and the court of appeals that the Federal Corporation had been guilty of infringement. A special master was appointed to determine the damages in the case, but meanwhile a second suit was begun against the corporation in regard to other patents not previously involved. The final settlement which has now been reached provides for permanent injunction against future infringements and for the payment of damages.

TELLING-BELLE VERNON COMPANY, Akron, Ohio, has begun work on a new $250,000 ice cream plant designed to produce 1,250,000 gal. of ice cream per year. It is planned to equip the delivery fleet for the plant with solid carbon-dioxide refrigerating equipment.

TRU-BLU BISCUIT COMPANY, recently purchased by the Loose-Wiles Biscuit Company, will undergo enlargement of the plants and facilities in Spokane, Portland, and Seattle. The Tru-Blu Company will continue under its own name in addition to handling Loose-Wiles products. The present officers will be maintained.

TRUSTEE FOOD SHARES, a fixed investment trust of the limited-discretionary type, composed of common stock of 28 outstanding corporations of the food industry, has been organized.

UNITED AFRICA CORPORATION, one of the largest cocoa producing companies in the world, was suspended from membership in the New York Cocoa Exchange on Sept. 19 for a one year period. The suspension was based on a rule on the exchange which requires all members to report their stock of cocoa in warehouses.

PERSONALS

D. W. ALBERT, horticulturist at the University of Arizona, will head a laboratory that has recently been established at Tempe, Ariz., to experiment with new methods of preparing dates for market.

F. S. ANHEUSER, JR., Anheuser-Busch, Inc.; H. L. MILLER, of the Chester Dairy Supply Company; and J. J. MOJONNIER, of Mojonnier Bros. Company, have been elected to fill

vacancies in the board of directors of the Dairy & Ice Cream Machinery Supplies Association. These vacancies were caused by the recent death of T. J. VALERIUS, of the Valerius Corporation, and of O. S. JORDAN, of Brown & Shaw, and by the resignation of ALBERT MCDOUGAL, of the Champion Line Machinery, Inc. E. W. CHANDLER, president of the Creamery Package Manufacturing Company, was made a member of the executive committee of the board of directors, filling a vacancy thereon caused by the death of Mr. Jordan. W. L. CHERRY, president of Cherry-Burrell Corporation, was made chairman of the finance committee, an office that was also formerly held by Mr. Jordan. The appointment of ROBERT F. EVERETT as executive vice-president of the association also was announced.

C. E. BYDE, for the past fifteen years affiliated with the Sun-Maid Raisin Growers, Fresno, Calif., will have charge of raisin receiving for the California Raisin Pool, Ltd., one of the co-operative marketing organizations represented in the California Grape Control Board.

HENRY J. CADLE, Trenton, N. J., formerly president of the Belle Meade Sweets Company, is now manager of the miscellaneous sales department of the Childs Company.

W. W. CARROLL has been appointed Eastern supervising engineer for plant operations of Adolf Gobel, Inc., New York City. Mr. Carroll was formerly with the National Union Radio Corporation.

CHARLES L. DRESSEL, who has been manager of the Zanesville (Ohio) branch of the Moores & Ross Company, Inc., ice cream manufacturer, has been transferred to Columbus, to become district manager of the Southeastern Ohio District for the company. He was succeeded at Zanesville by Carl Flowers. The Moores & Ross Company is a subsidiary of the Borden Company.

A. V. B. KLEIN, former manager of manufacturing operations of Sun-Maid Raisin Growers, Fresno, Calif., has been made manager of the San Joaquin Valley Grower-Shipper Association, a fresh-fruit co-operative unit in the Federal Farm Board program.

J. E. MCINTYRE has been made manager of the Ward Baking Company branch in Columbus, Ohio. Mr. McIntyre was formerly manager of the Ward branch in Birmingham, Ala.

H. T. MCKEE has been nominated for the presidency of the New York Cocoa Exchange to succeed Eugene A. Canalizo, by the nominating committee. GEORGE HINTZ has been nominated as vice-president and chairman of the executive committee, the position formerly held by Mr. McKee. An independent ticket to oppose the regular slate at the elections on Oct. 14 has been announced. WILLIAM J. KIBBE is proposed as president and I. HENRY HIRSCH for vice-president on the opposition list.

FRANK S. MEYER has been elected president of Natural Sugars, Inc., New York City, a company recently formed to deal in sugar, sirup, maple sugar, and other raw materials for the confectionery, ice cream, and baking trade.

R. L. NICHOLS has been appointed sales representative in the Southern territory for Ungerer & Company, New York City, manufacturers of essential oils and raw materials for flavoring.

V. N. PRICE, of the National Candy Company, St. Louis, Mo., has been appointed chairman of the committee which the National Confectioners' Association recently delegated to investigate formation of a Candy Institute. Seventeen other leading figures in the industry will aid Mr. Price in determining the character, scope, and financing most suitable for the proposed body.

SHELLY WHITE, formerly assistant general manager of the California Barrel Company, San Francisco, Calif., has been appointed executive vice-president and temporary manager of the California Grape Control Board, Ltd., according to announcement of Frederick J. Koster, chairman of the board of directors.

Campbell President Dies

Wide World Photo

JOHN T. DORRANCE, president of the Campbell Soup Company and founder of the canned soup industry, died of heart disease at his home, Pomona Farm, near Cinnaminson, N. J., on Sept. 21. He was 57 years of age.

From a $7.50 a week employee in his uncle's canning factory, Dr. Dorrance rose to the leadership of a world-wide business organization whose advertising expenditures alone are said to total $3,000,000 a year. He was born at Bristol, Pa., and was graduated from Massachusetts Institute of Technology in 1895. Two years later he received a doctor's degree from the University of Göttingen in Germany. It is said that he conceived the idea of canning soups in concentrated form while studying in Europe, and that he worked with several famous Parisian chefs to learn the proper flavoring of soups.

He went to work in the Joseph Campbell Preserve Company in 1898, and the first condensed canned soup was put out the following year. He became a director and vice-president of the company a year later. The success of the soups gradually subordinated other products manufactured by the company, until finally the name was changed to Campbell Soup Company. In 1914, Dr. Dorrance was made president and general manager. The increasing success which has come to the company is attributed to the early recognition by Dr. Dorrance of the value of high speed, mechanized production methods, strict quality control, and continual advertising.

OBITUARY

EARL H. FARMER, assistant general sales manager of the Owen-Illinois Glass Company, died suddenly on Aug. 29. Mr. Farmer had been employed by the company for many years and had risen from the position of stenographer with the Owens Bottle Company to assistant general sales manager of the organization of which the bottle company later became a part.

CHESTER GAMMON, a prominent figure in the Southern California canning industry, died recently, after a short illness. Mr. Gammon was 46 years old, and at the time of his death was general superintendent of the California Sanitary Canning Company, of Los Angeles, Calif. He was a founder of the Van Nuys Canning Company, now a part of the Newhoff Packing Corporation.

IRA F. HUTCHINGS, a pioneer canner of the Northwest and one of the founders of the Northwest Canners' Association, died a short time ago at Corvallis, Ore., where he was manager of the Western Oregon Packing Corporation. Mr. Hutchings was a former director of the National Canners' Association for Oregon and was long a director of the Northwest Canners' Association.

GEORGE D. PARKER, inventor of box-making machinery used in fruit packing and head of the Parker Machine Works, of Riverside, Calif., died Aug. 24. Mr. Parker had patents on automatic nailing machines, fruit separators, fruit sizers, sorters, and dryers, in addition to his box-making device. He was 60 years of age.

E. ALBERTA READ, assistant chief of the micro-analytical laboratory of the Bureau of Chemistry, Department of Agriculture, died at her home in Washington on Sept. 1. She had served continuously in the laboratory since 1907.

New Construction

Bakery—City Baking Co., 306-324 North Gay St., Baltimore, Md., awarded contract for a 1 story, 105 x 207 ft. building, including packing floor and stables, automobile repair shop, loading room, etc., to Consolidated Engineering Co., 20 East Franklin St., Baltimore.

Bakery — Dugan Bros. Baking Co., White Plains, N. Y., awarded contract for the construction of a distribution plant, garage, etc., to I. F. Stier, Madison, N. J. Estimated cost $150,000.

Bakery — Freihofer Baking Co., 20th and Indiana Sts., Philadelphia, Pa., awarded contract for a 1 story, 30 x 280 ft. bakery to P. Harbach Co., 1261 North 26th St., Philadelphia. Estimated cost $75,000.

Bakery, etc.—Dept. of Correction, State Bldg., Capitol, Albany, N. Y., will receive bids late in September for the construction of a bakery, kitchen, etc. for State Prison, Auburn.

Bakery — C. Lanis, Klamath Falls, Ore., awarded contract for a 2 story, 42 x 100 ft. bakery at 7th and Main Sts., to James Quinn Construction Co., Klamath Falls. Estimated cost $40,000. Equipment will be required.

Bakery — Monroe Realty & Mfg. Co., B. Pecher, Pres., 468 Cherry St., New York, N. Y., plans a 100 x 150 ft. bakery at Coney Island Ave. and Ave. U, Brooklyn. Estimated cost $125,000. The McCormick Co., 41 Park Row, New York, N. Y., Archt.

Bakery—S. Piantedosi, 83 Main St., Everett, Mass., will soon award contract for a 1 story bakery. Estimated cost $40,000 to $50,000. Private plans.

Bakery — Sussman Bros., 547 Grand Ave., Astoria, N. Y., will soon receive bids for the construction of a bakery at 25th Ave. and 45th St. Estimated cost $40,000. J. H. Galloway, Jackson Heights, Archt.

Bottling Plant—Coca Cola Co., Washington, Ind., will receive bids until Oct. 6 for the construction of a 2 story, 50 x 100 ft. bottling plant at Main and Second Sts. Estimated cost $40,000. B. Clawson, Washington, is architect.

Bottling Plant—Alabama Coca Cola Bottling Co., Anniston, Ala., awarded contract for a 2 story, 70 x 130 ft. bottling plant on Nobel St. between 4th and 5th Sts. to Duke-Stickney Construction Co., Anniston. Estimated cost $75,000.

Brewery—Rubsam & Horrman Brewing Co., 191 Canal St., Stapleton, N. Y., plans to rebuild brewery including refrigeration system, recently destroyed by fire. Estimated cost to exceed $300,000.

Winery Addition—Kaplan & Shrachman, 305 Dundas St. W., Toronto, Ont., are receiving bids for addition to winery for Danforth Wine Co. Ltd., 355 Danforth Ave. Estimated cost $50,000.

Canning Plant—Francisco & Jacobus, 511 5th Ave., New York, N. Y., Archts., will receive bids about Nov. 1 for the construction of a 5 story, 130 x 340 ft. canning plant at Arch St., Camden, N. J. for Campbell Soup Co., c/o Continental Can Co., 1 Pershing Sq., New York. Estimated cost $150,000.

Canning Plant — Rice Bros., S. E. Rice, Apalachicola, Fla., awarded contract for a 2 story, 60 x 125 ft. canning plant at Eustis.

Canning Plant Addition—Stokely Bros. & Co., Louisville, Ky., plans addition to plant and installation of new machinery for canning beans and tomatoes at Anderson, Ind. Estimated cost $40,000.

Creamery — Cloverleaf Creameries Inc., Huntington, Ind., is having plans prepared for addition to plant. Estimated cost $50,000. Private plans.

Creamery—Dairymen's Co-Operative Creamery of Boise Valley, c/o J. R. Brown, Mgr., Boise, Idaho, has work under way on a 1 story, 132 x 200 ft. creamery at Caldwell. Estimated cost $101,200. Work being done by day labor under the supervision of The Austin Co., Dexter Horton Bldg., Seattle, Wash., Engrs.

Creamery—Lorain Creamery Co., Lorain, O., had plans prepared for a 1 story, 55 x 115 ft. creamery plant at 14th and Oberlin Sts. Estimated cost $40,000. L. J. Weiskopf, 7016 Euclid Ave., Cleveland, is architect.

Dairy Plant—Modern Dairy Co., South Second St., Portsmouth, O., awarded contract for the construction of a plant at 235 South Second St. to Dennis Brickley, Portsmouth. $30,000.

Dairy Plant — Clarks Dairy Ltd., Bronson Ave., Ottawa, Ont., awarded contract for the construction of a dairy plant to Fryer & Pout, Euclid Rd., Ottawa. $50,000.

Dairy Plant — G. Willaredt, 411 23rd St., West New York, N. J., Archt., will receive bids about Nov. 1 for a 2 story, 28 x 155 ft. dairy plant at 45th St., and New York Ave., for Consumers Dairy Co., 400 45th St., Union City. Estimated cost $45,000.

Dairy Plant—Puritan Dairy Products Co., 683 New Brunswick Ave., Perth Amboy, N. J., will soon award contract for a 1 and 2 story dairy plant. Estimated cost $40,000. Ballinger Co., 100 East 42nd St., New York, N. Y., is architect.

Ice Cream Plant — Horton Ice Cream Co., 205 East 24th St., New York, N. Y., awarded contract for addition to ice cream plant at Gouverneur to Peirson Bros., 215 43rd St., Brooklyn. Estimated cost $60,000.

Ice Cream Plant—Telling-Belle Vernon Co., 235 East Exchange St., Akron, O., awarded contract for the construction of a 3 story, 102 x 122 ft. ice cream plant at Cedar and Water Sts. to C. W. & P. Construction Co., Second National Bldg., Akron. Estimated cost $250,000.

Ice Cream Plant Addition—Jersey Ice Cream Co., 1726 East Pratt St., is having plans prepared for a 2 story, 100 x 185 ft. addition to ice cream plant at 122-23 South Ann St. Estimated cost $175,000. McCormick & Co., 121 South Negley Ave., Pittsburgh, Pa., are engineers.

Milk Distribution Plant — Bailey Farm & Dairy Co., 5005 Alabama Ave., St. Louis, Mo., awarded contract for the construction of a 2 story, 37 x 90 ft. plant and 35 x 150 ft. service station at Delor and Alabama Ave. to Kellerman Contracting Co., Buder Bldg., St. Louis.

Milk Distribution Station — Borden's Farm Products Co. of Illinois, 326 West Madison St., Chicago, Ill., awarded contract for a milk distribution station at 20th St. and Vincennes Ave., Blue Island, to G. Thomson & Son, 30 North La Salle St., Chicago. Estimated cost $150,000.

Milk Products Plant—Lactol Corp., 203 California St., San Francisco, Calif., is having plans prepared for the construction of a 1 story, 30 x 60 ft. milk products plant at King City. Private plans.

Pasteurizing Plant — Shepard Dairy, Whalley Ave., New Haven, Conn., is having plans prepared for the construction of a pasteurizing plant, including equipment. L. J. A. Julianelle, Metropolitan Bldg., New Haven, is engineer.

Cold Storage Plant—H. Moffatt & Co., 3rd St. and Arthur Ave., San Francisco, Calif., awarded contract for a 2 story cold storage plant to Barrett & Hilp, 918 Harrison St., San Francisco. $75,000.

Cold Storage Plant — Penick & Ford Ltd., Harvey, La., awarded contract for a 117 x 117 ft. factory and cold storage plant, to G. J. Glover Co. Inc., Whitney Bank Bldg., New Orleans. Estimated cost $50,000.

Cold Storage Plant — Port Commission, Olympia, Wash., is receiving bids for first unit of cold storage plant 5,000 bbl. capacity. $100,000. Total estimated cost $500,000. O. Murray, Olympia, is engineer.

Cold Storage Plant—U. S. Government, A. W. Parker, Construction Quartermaster, Schertz, Tex., will soon award contract for a 180 x 280 ft. post exchange plant, including cold storage plant, etc., at Randolph Field, 14 mi. north of San Antonio. Estimated cost $50,000.

Ice Plant—Mongiello Bros., 626 Communipaw Ave., Jersey City, N. J., will receive bids about Oct. 15 for the construction of a 1 story, 100 x 100 ft. ice plant. Estimated cost $50,000. C. H. Ziegler, 26 Journal Sq., Jersey City, is engineer.

Ice Manufacturing Plant — Paramount Ice Co., 241 Ellery St., Brooklyn, N. Y., awarded contract for the construction of an ice manufacturing plant at Steuben St. and Myrtle Ave. to William Werner & Son, 110 Hale Ave., Brooklyn. Estimated cost $60,000.

Ice Manufacturing Plant—Southern New England Ice Co., R. G. Hadley, Pres., New Britain, Conn., is having plans prepared for the construction of an ice manufacturing plant on Corbin Pl. Estimated cost $100,000. Private plans.

Pre-Cooling Plant — Casa Blanca Packing House, Riverside, Calif., awarded contract for a 2 story, 70 x 90 ft. pre-cooling plant to Gay Engineering Corp., 2650 Santa Fe Ave., Los Angeles.

Linseed Plant Addition — Dominion Linseed Co. Ltd., Owen Sound, Ont., plans a 2 story addition to plant including 75,000 bu. storage elevator, 20,000 gal. molasses tank, etc. Estimated cost $75,000. Work will be done by day labor.

Pickle and Preserve Plant — Squire Dingee Co., 1918 Elston Ave., Chicago, Ill., awarded masonry and carpentry contracts for a 4 story, 88 x 151 ft. factory for making pickles and preserves known as "Ma Brown's Pickles." Estimated cost $70,000.

Potato Chip Factory—Blue Bird Potato Chip Co., 68th Ave. and Beck St., Oakland, Calif., plans a 1 story factory at First Ave. and 14th St. Estimated cost $40,000. Architect not selected.

Cereal Factory—Kellogg Co., W. Kellogg Mgr., Battle Creek, Mich., plans addition to plant on Dundas St., London, Ont. Estimated cost $250,000. Equipment will be required.

Grain Elevator — Ballard & Ballard Co., R. Borries, V. Pres., 912 East Broadway, Louisville, Ky., awarded contract for first unit of grain elevator, 60 x 165 ft., 712,000 bu. capacity to include 21 circular tanks of 17 ft. diameter; 46 interstice bins, various sizes all 110 ft. high; two 500 bu. per hr. dryers and elevating and conveying machinery at Barret Ave. near Broadway to Jones Hettelsater Co., 600 Mutual Bldg., Kansas City, Mo. Estimated cost $250,000. Ultimate total cost $750,000.

Grain Elevator—Dept. of Railways & Canals, Ottawa, Ont., awarded contract for boiler house equipment to Babcock-Wilcox and Goldie-McCulloch, Ltd., Galt, Ont., and generator room equipment to C. A. Parsons & Co. Ltd., Royal Bank Bldg., Toronto, for 2,500,000 bu. grain elevator. Total estimated cost $550,000.

Grain Elevator Addition — Dept. of Public Works, Ottawa, Ont., awarded contract for a 168 x 192 ft. grain elevator to Bennett & White, 1116 Ninth Ave. W., Calgary, Alta. Estimated cost $600,000. Complete new machinery for handling grain will be installed.

Rice Mill—California Rice Growers Association, E. L. Adams, Pres., Chico, Calif., awarded contract for a rice mill at Broderick to McGillivray Construction Co., Folsom Blvd. and 65th St., Sacramento. $100,000.

Rice Mill—Jonesboro Rice Milling Co., H. E. Boyer, Pres., Memphis, Tenn., is having preliminary plans prepared for a rice mill at Jonesboro, Ark. Estimated cost $125,000.

Packing House—G. A. Carey Inc., Plant City, Fla., awarded contract for a 150 x 150 ft. packing house on East Raynolds St. to G. E. Wilson, Plant City.

Packing Plant — Albright-Nell Co., 5315 South Western Ave., Chicago, Ill., manufacturers of packing plant machinery, awarded masonry and carpentry contracts for a 1 story, 140 x 200 ft. addition to factory. Estimated cost $55,000.

Packing Plant—John Duff & Sons Ltd., Hillyard St., J. F. Duff, Pres. and Gen. Mgr., Hamilton, Ont., is having plans prepared for the construction of a packing plant on Brandt St. Estimated cost $75,000. Stewart McPhie, Sun Life Bldg., Hamilton, is architect. Equipment will be required.

Packing Plant Addition — Orange Heights Fruit Association, Corona, Calif., awarded contract for a 1 story addition to packing plant to Hamm, Grant & Bruner, 607 Ferguson Bldg., Los Angeles. $45,250.

Packing Plant (Meat)—King City Meat Co., J. Linn, et al., King City, Calif., awarded contract for a 1 story meat packing plant. H. Thompson, Monterey, Calif. $15,000.